

## Introduction

Hi everyone!

Have you heard about STEAM? It's an approach to learning that incorporates Science, Technology, Engineering, Art, and Mathematics.

STEAM plays a key role in making railway models and dioramas. The eyes of science that look closely at nature, the power of technology to express what you see, the spirit of engineering to bring designs to reality, the goal of art to create things of beauty, and the knowledge of mathematics to support these activities are all helpful for making railway models and dioramas. Operating railway models and creating dioramas will help grow your STEAM skills and learning more about STEAM will boost your ability to create railway models and dioramas.

STEAM Up Your Railway Modelling! aims to give you know-how that will help you make railway models and dioramas. With STEAM in mind, you'll enjoy making railway models and dioramas more and enhance your STEAM skills!

This program would not be possible without the assistance of Dr. Marie Oshima and Dr. Shio Kawagoe of the Office for the Next Generation (ONG) at the Institute of Industrial Science, the University of Tokyo. I wish to extend my deep appreciation for their advice on the scientific and educational aspects of the program.

Summer, 2019

Hiroshi Kato  
President  
Kato Precision Railroad Models

## Contents

01 The Basics of Railway Modelling	04-05
02 Devise a Concept and Make It Stand Out	06-07
03 Create a World on a Board	08-09
04 Observe the Natural World	10-11
05 Observe the Human World	12-13
06 Learn About the Way Our Eyes Move	14-15
07 Make the Best Use of Materials and Tools	16-17
08 Improve Your Depiction of the Ground Surface	18-19
09 Improve Your Depiction of the Terrain	20-21
10 Improve Your Depiction of Trees and Grasses	22-23
11 Improve Your Depiction of Water	24-25
12 Improve Your Depiction of Human-Made Structures	26-27
13 Create a World of Fantasy	28-29
14 Promote Your Completed Diorama	30-31

### [Notes on Icons]

Symbols used in this booklet

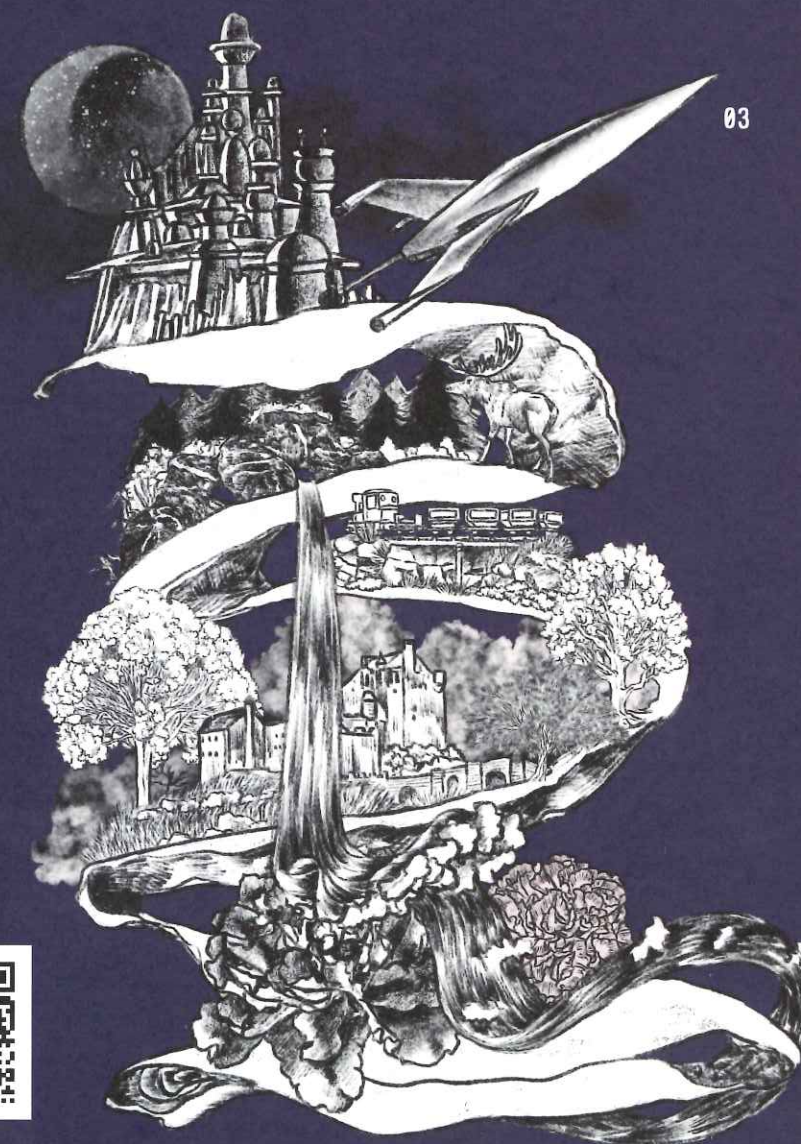
The letters of the alphabet accompanying the topics in each article represent the areas of STEAM most closely related to those topics.

- S** Science
- T** Technology
- E** Engineering
- A** Art
- M** Mathematics

### [Site Information]

Access the website below for further information on *STEAM Up Your Railway Modelling!*

<https://www.katomodels.com>

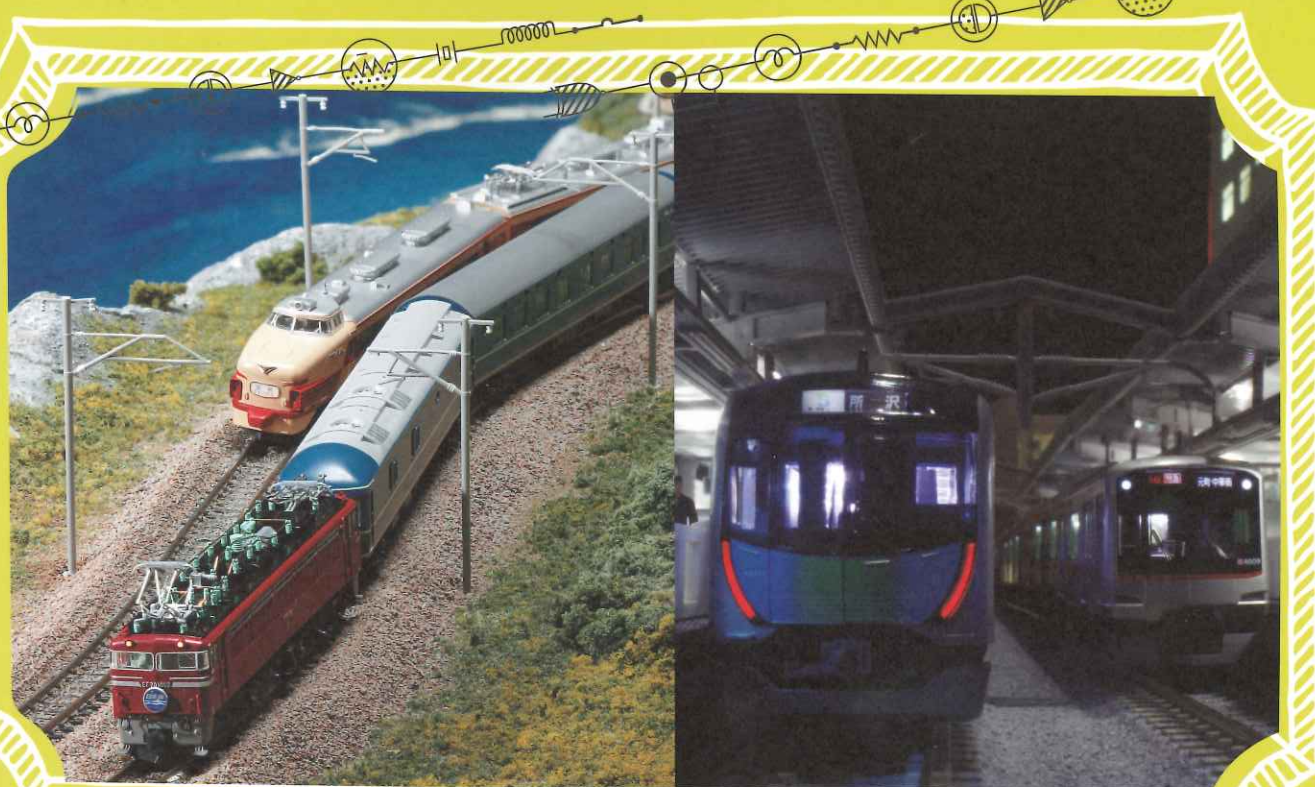




# 01 The Basics of Railway Modelling

POINT

- 1 The well-known standard N gauge railway model has a scale of about 1/150. Keep "about 1/150" in mind to help you design your dioramas.
- 2 Model trains use electric motors to move. Increasing the voltage on the power pack makes the train move faster.
- 3 Model trains run on direct current electricity. The motor turns when it is supplied by the current flowing in the two rails.



Model trains running on N-gauge rails. They are powered by electricity, which can also be used to light your diorama.

Model railways are smaller versions of the real-life rail widths, trains, and other railway dimensions. In the most popular standard called N gauge, the distance between the rails is 9 mm (N comes from the English word "nine"). This is about 1/150th of the actual rail width. In N gauge, model trains, buildings, and people are all about 150 times smaller than their actual sizes.

To design and make a diorama, you'll find it useful if you keep in mind that N gauge is about 1/150th of the real size. Supposing that the height of an average person is roughly 150 cm, the N gauge height would be 1/150th of this, and so the height of a model figure will be about 1 cm. Just keep this in mind and you'll get

a sense of the scale for buildings, roads, and towns.

Another basic element of model railways is that trains run on electric motors. Electrical current flows from the track to the motor in the train. The current rotates the motor, the wheels are also rotated in turn, and the train moves.

There are two types of electrical current: direct current (DC) and alternating current (AC). Model train motors run on DC. Changing the level of current makes the train run faster or slower.

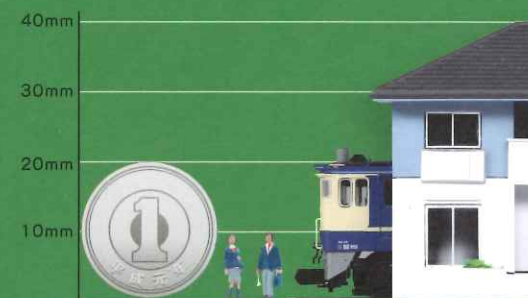


## Connecting the Real World and the N Gauge World: 1/150 $\leftarrow \rightarrow$ $\times 150$

N gauge figures you can buy are about 1 cm in height. Here's a rough guide: the height to the ceiling of a building is about twice the height of an adult, so the height of one storey is 2 cm. A two-storey building is therefore 4 cm high. There are several types of layout boards commonly used with N gauge models, so if you multiply their dimensions by 150, you can see how much of the actual cityscape or natural scenery you can fit in. Even if you can't fit the image you've designed on a single board, you can use special techniques to achieve your aim (see Page 7).



Komaba-Todaimae Station (Meguro-ku, Tokyo) on the Keio Inokashira Line  
Kurama Station (Sakyo-ku, Kyoto) on the Eizan Kurama Line  
-Source: GSI Globe, Geospatial Information Authority of Japan



Model sizes in N gauge. Knowing that coins such as 1 Japanese yen, 1 British penny, and 1 US cent are all about 2 cm in diameter is also useful when thinking about the scale.



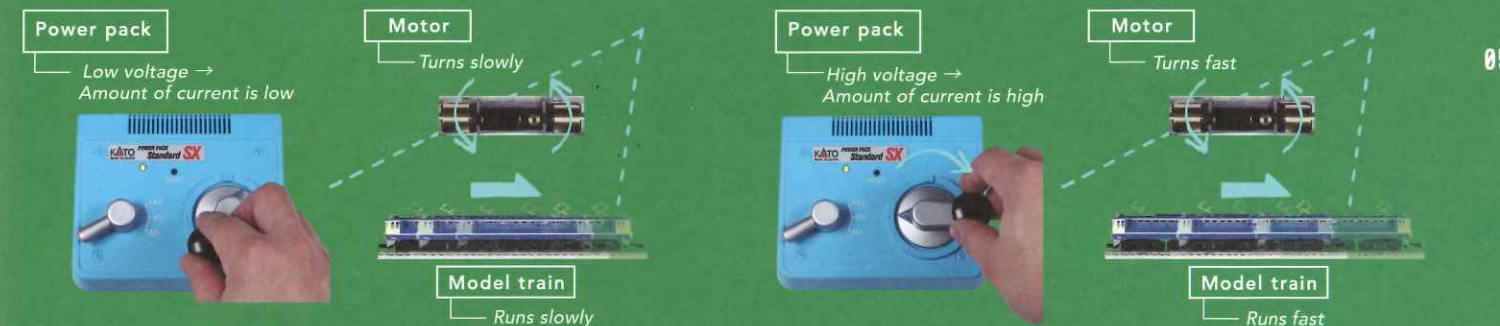
T-TRAK Diorama Boards  
Single 335 x 308 mm  
Double 335 x 618 mm  
Corner 363 x 363 mm

Boards for the Japan High School Model Rail Contest  
Straight 300 x 900 mm  
Curved 600 x 600 mm  
Layout size for Tatami Contest: Minimum 600 x 1200 mm to maximum 910 x 1820 mm



## Current and Voltage Determine the Speed of a Train

The faster a model train motor turns, the faster its wheels will rotate and the faster the train will run. The current determines the speed of rotation of the motor. The amount of current supplied changes with the voltage. The higher the voltage, the higher the current, the faster the motor turns and the faster the train moves. Railway models use a device called a power pack which has a mechanism to control the voltage so the train can run faster, slower, or stop.

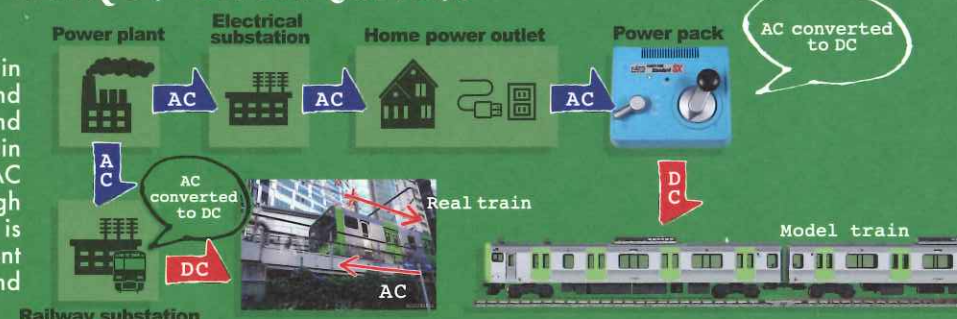


Increasing the voltage increases the amount of current flowing and makes the motor rotate faster. The power pack can control the voltage from 0 to 12 volts (V). Think of the current as being the number of electrons flowing per second, and the voltage as the pressure pushing each electron.



## Trains Run and Lights Work on Direct Current

There are two types of current: direct current (DC) in which the current flows in one direction only, and alternating current (AC) in which the direction and size of flow change with time. DC drives the train motor and powers the lights in a railway model. AC is generated in power stations and passes through substations to household power outlets and is converted to DC by the power pack. To pass current through a model train motor, you need positive and negative electrodes, which are the two rails.



Model trains run on electricity produced at the power plant. The electricity is converted from AC to DC by the power pack. Many trains in real life use DC, which is converted from AC at a railway substation.

## Learn More

To learn more about how the motors of model trains and real trains work, watch the video linked below (in Japanese), made by the Office for the Next Generation at the University of Tokyo. The lecturers provide simple explanations of how train motors work, the relationship between the speed of the train and current, and the history of the technology of the train motor. Learn How Train Motors Work!



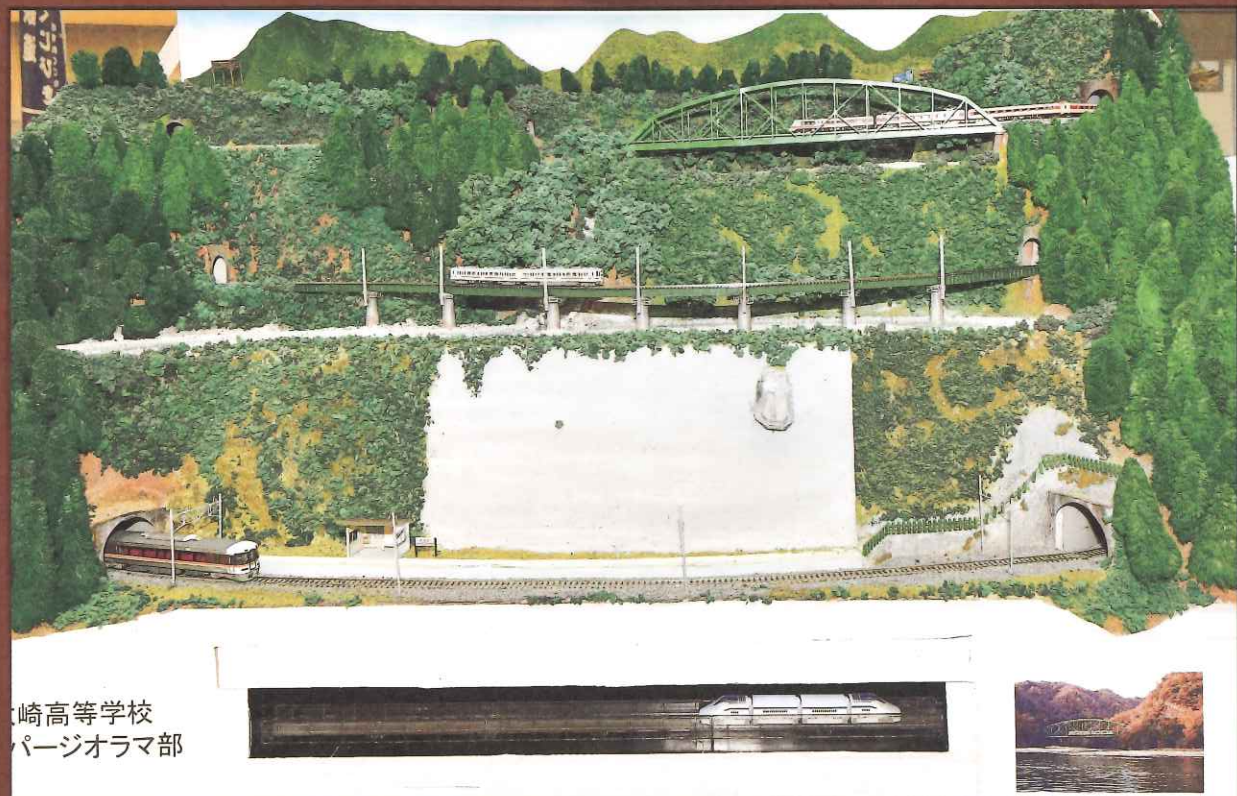
<http://ong.iis.u-tokyo.ac.jp/visual.html>



## 02 Devise a Concept and Make It Stand Out



- 1 If you clearly express what you want to depict in a railway model – the concept – it will be easier to create and result in a more complete project.
- 2 To make the concept stand out, think about using techniques for emphasizing the necessary and omitting any unnecessary elements.
- 3 Sketching your idea will make it clear what you want to depict and what you should emphasize or omit.



The perspective method is used to highlight the concept, with the scale of the model increasing from the back to the front. Telling the story of the evolution of rail, the diorama shows trains on the former Tohyama Forest Railway and the current Iida Line crossing the Mangokawa Railway Bridge, the Watarazunohashi bridge, and passing Tamoto Station, and a linear Shinkansen running underground.

-Tokyo Metropolitan Osaki High School, 2018

In railway modelling, you build what you want to depict on a board. This is called the concept and is the idea or perspective that you want to flow throughout the work. It's very important to define your concept first when making a railway model. If your goal is clearly defined, the way to achieve the goal will be clearer and the work will come together. And if you have a solid concept, it will be obvious to the viewer, who will appreciate the work better.

Creating a concept starts with working out in your mind the scene that you want to display – A city familiar in everyday life. Somewhere you

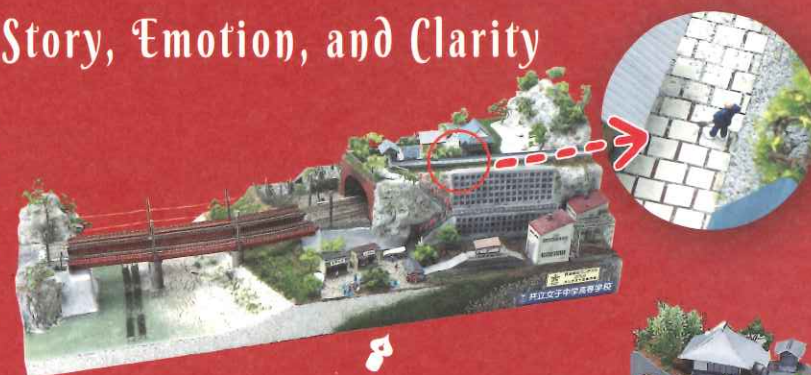
went for the first time and enjoyed. A place full of personal memories.... If you think about how to depict the scene as you cherish your impressions of it, the concept will become clearer. Once you have decided on the concept, think about how to emphasize the parts that are important to you. Drawing a sketch of the scene that you want to depict in a railway model can help you identify these parts.



## 03 The Keys to a Concept Are Story, Emotion, and Clarity

The concept of a railway model will stand out when you are aware of aspects like story, emotion, and clarity. A story is a development that lets you imagine what has happened and what will happen for people and things that are depicted in the model. Emotion will surprise, amuse, or move the viewer in some way. Clarity means that there is no ambiguity about the concept. Be aware of these things as you work on what you want to depict, and the concept will become distinctive.

The secret N-1 moon rocket, planned but never launched by the former Soviet Union. Clarity of concept: the railway is used for transporting the rocket.  
'Former Soviet N-1 Moon Rocket and Transportation Train (T33 + 11U25)'  
-Eisugakkan High School, 2018



Swept by the priest, the clean and tidy garden makes us imagine the past and future.  
'Mountain Temple'-Kyoritsu Girls' Junior & Senior High School, 2018

Created while thinking about the section of the Kominato Railway line that was planned but never built. This stimulates the imagination of the viewer.  
'Phantom End of the Line, Kominato Railway'  
-Mobara Hokuryou High School, 2017



## 04 Use Special Techniques for What You Want to Depict

Emphasize what you want to depict in your diorama. You might think about depicting an actual scene or an exact moment in your railway model, and if that's the concept of the diorama, that's what you should aim for. On the other hand, you can also emphasize your own individual ideas. Magnify or simplify the parts you want to depict or omit parts that are irrelevant to the concept.

In the model, the number of trees in the loop is reduced and the rock surface is emphasized.  
'The World of Paper! A Trip to Switzerland with Amazing Views'  
-TokyoMetropolitanOsaki High School, 2017

The actual Brusio spiral loop bridge in Switzerland.



## 05 Organize Your Ideas with a Sketch

One effective way of defining a concept or thinking about emphasis is to draw a picture of the scene you want to depict. Some people visit the location and sketch the scenery. Drawing a picture helps you to organize in your own mind the parts you want to emphasize and those you don't need.



To create a diorama that encourages viewers to think about going there too, we went to Hakone and drew illustrations and plans.  
'Hakone' -Shiba Junior & Senior High School, 2018



## Learn More

It's important to solidify the concept not only when building a railway model, but also when making, designing, and planning other things. Planning a concept is called conceptual design. Search for "conceptual design" on the Internet and you'll get a lot of tips and hints for how to master this process.

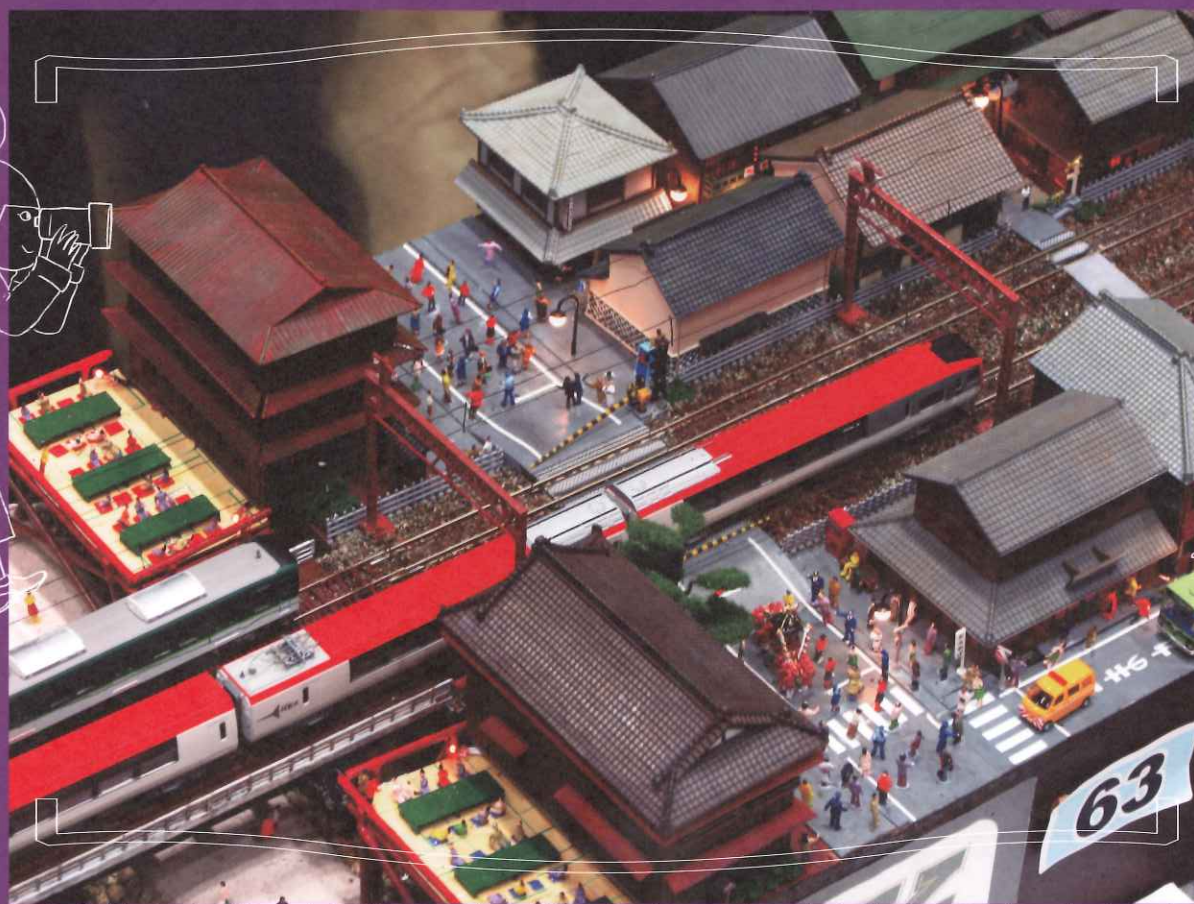




# 03 Create a World on a Board



- 1 When the viewer of a railway model feels that there is a world in front of them, they become attracted to that world.
- 2 Try to create a world in the viewer's mind.
- 3 Your depiction of the world will be even better if your model is so complete that there's nothing left to add. God is in the details.



Inspired by the city of Kyoto during the summer festival. By paying close attention to the details, the creator draws the viewers into their world.

'Seasonal Event in Kyoto' - Kanto Gakuin Mutsuura Junior & Senior High School, 2018

What is it about a diorama that attracts and fascinates viewers? One of the answers is to make the viewers feel that there is an entire world on the board.

In this context, "world" doesn't mean the nations of the earth, but the atmosphere of the entire scene represented on a single board. When a viewer looks at a diorama, the feeling that there is a world in front of them comes across as certainty that this must represent the actual scene in that place.

Viewers feel that there is a world in a diorama

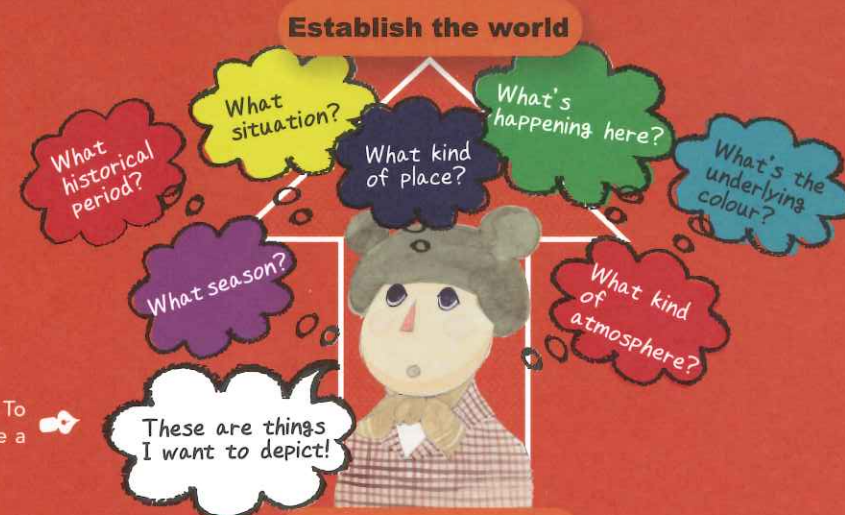
because it has a unified appearance. All the elements present on the board are put together to fulfil the defined concept. To create a sense of unity, it's also important to make the work complete: elaborating even the smallest details and eliminating wherever possible, any elements that might destroy the atmosphere.



## Set Up the World You Want the Viewer to Experience

Set up the world that you want the viewer to experience. Basically, you set up the world on the basis that it includes an operating railway (If you try to depict a world in a railway model that is unrelated to railway, the railway will look out of place). Depending on the concept, some of the questions you might ask yourself are "What kind of place is it?", "What season is it?" and "What kind of atmosphere is it?", "What is the situation?", "What's happening there?", "What historical period is it?", and "What is the underlying colour?"

Set up the world that you want viewers to experience. To realize the concept — what you want to depict — define a consistent atmosphere on the board.



Establish the world

Establish the world



## Create an Impression in the Viewer's Mind and Make Them Think

When you look at this diorama, thoughts like this may come to mind: "I love a town with sloping streets. I'd like to climb those steps" or "The cherry blossoms are in full bloom. The cold winter is over". This is because "the world" has made an impression on you. How can you draw out these images with a diorama? First, appeal to the viewer's memory to draw out an impression such as "I've been there before" or "I've seen it in a poster". Next, appeal to the viewer's imagination and make them think thoughts such as "What's going to happen next?" or "How would I feel if I stood here?".



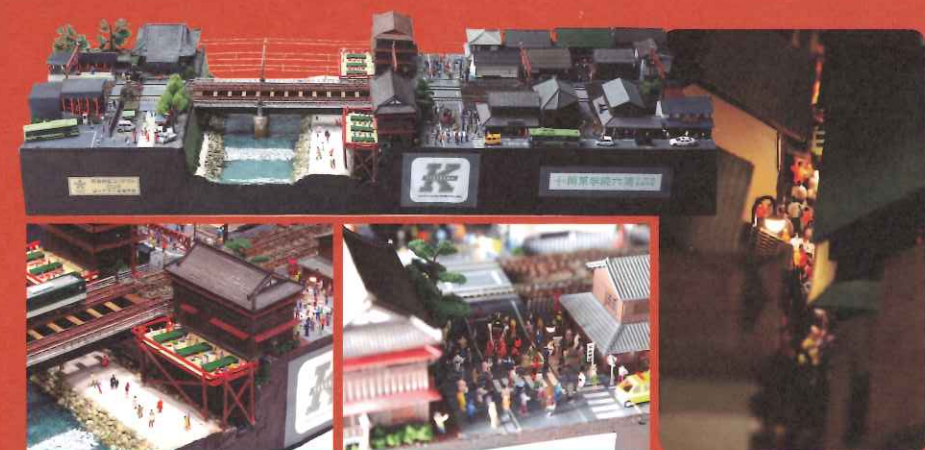
'Late Autumn' - Kyoritsu Girls' Junior & Senior School, 2017

The world starts to surface in the viewer's mind. The memory is jogged to create an impression. The imagination is stimulated to produce ideas.



## 'God is in the Details'

To help the viewer experience the world you have created, it's important to eliminate any distractions that interfere with that experience. We therefore want to aim for completeness. Check for inconsistencies and ambiguous or unfinished elements and try to make the world unified and complete. Remember the saying "God is in the details", which means that people are more satisfied when all the details are correct. Be mindful about creating a consistent world.



Detail of the diorama on Page 8. The creators aimed to reproduce the atmosphere of Kyoto in every detail. The diorama is modelled on the area around Fushimi Inari Station on the Keihan Main Line, and also includes the Kamogawa riverbed.

## Learn More

The saying "God is in the details" was devised by German-born architect Ludwig Mies van der Rohe (1868-1969) and was popular among architects in the United States. Another of van der Rohe's sayings was "Less is more". Many of the buildings and furniture that he designed are still in use. Look carefully at photographs of his works to understand the meaning of his words.

The Barcelona Chair, designed by Mies van der Rohe for the King of Spain's visit to the 1929 Barcelona Exposition, is regarded as a masterpiece of modern design.





# 04 Observe the Natural World

- 1 Almost nothing in nature is straight.
- 2 In the natural world, some shapes look similar whether viewed from near or afar.
- 3 Look closely at natural boundaries and incorporate those features in your railway model.



Although the scale is different, the forest looks just like the real thing. The area around the track and the green boundary are also depicted realistically.

'Countryside Scenery with a Diesel Train'  
-Suginami Technical High School, 2017

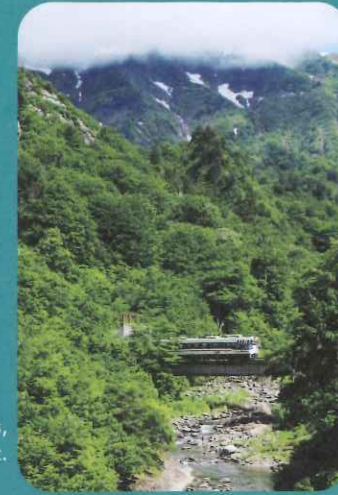
Many people enjoy presenting natural scenery in dioramas. The goal is to create a diorama that makes both the creator and viewers feel that there is nothing unnatural in the appearance of the scenery. To achieve this, it's important to observe nature. There are many models around you, such as forests, meadows, rocks, rivers, and beaches. Look closely at the various natural features and understand their characteristics and conditions. Include the characteristics of nature you identify in your diorama and omit elements that can't be considered natural. This

way, you will improve the depiction of natural scenery in your diorama. One of the most distinctive characteristics of nature is that it has almost no straight lines. The English landscape architect William Kent said, "Nature abhors a straight line". This characteristic of nature can be used in the creation of dioramas.



## The Shapes of Natural Features Are Rarely Straight

Most natural features don't have straight lines. Unlike gardens and riverbeds, which are artificially created while preserving their natural appearance, there are no linear characteristics in the way tree trunks and branches grow, the shape of rocks, or the flow of rivers. Straight lines are rarely found in the natural world because all things on the Earth are affected by forces such as gravity, and these forces don't act in the same direction. When you try to depict nature in a diorama, you should check whether there are any straight lines.



Railways and bridges have straight lines, natural features don't.



There's not a single straight line on the rock surface.

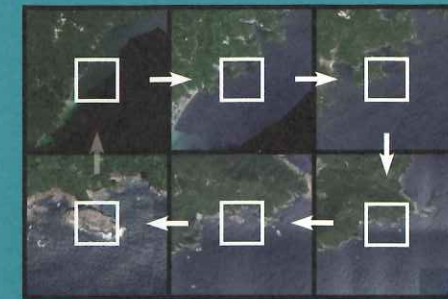


The Mogami River meanders along its well-worn path.



## Making Use of Nature's Similarities in Dioramas

Certain shapes look similar whether you see them from far away or close. In the natural world, there are some shapes that are similar or close to similar. For example, coastlines and rocks and stones that have been worn to round shapes may be similar. Dioramas are a way of expressing a large real thing by reducing it to a small scale. So, when you want to include boulders in a diorama, you can use pebbles instead.



The shape of the coastline in the illustration doesn't change when we zoom in or out. Shapes whose parts resemble the whole are called fractals, which are studied in mathematics.



Boulders and rocks become rounded from the effects of temperature, ice and snow, air and water. The shapes of both are very similar.



## Look at Boundaries to Show the Natural World as It Really Is

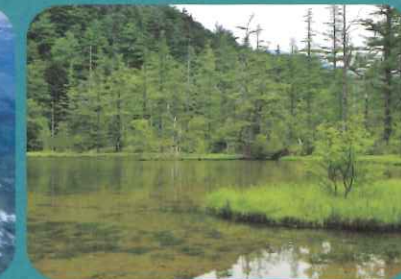
One of the keys to making dioramas is how you represent boundaries, because this is where patterns become distinctive. For example, the boundary between sea and land. The fluid, natural form of the sea is shaped by the water in it, but as soon as the boundary is crossed, we see the land composed of unchanging rocks and soil. In other words, the changes at the boundary are far greater than those in the sea or on land. Observing these changes will lead to a more realistic representation of the boundaries in your diorama.



The boundary between railway track and meadow. Grass even grows in the boundary.



The coast as a boundary between sea and land.



The boundary between pond and land, containing grass and shrubs.



Satellite imagery services such as the Geospatial Information Authority of Japan and Google Earth can also be used to examine boundaries. Around Kamogawa City, Chiba Prefecture.  
-Source: Maps and Aerial Photography Service, Geospatial Information Authority of Japan

## Learn More

One characteristic of nature is that the shape of the coastline does not change even if magnified. This characteristic is known as a Koch curve in fractal geometry. Fractal geometry is a field of mathematics developed by American mathematician Benoit Mandelbrot in the 1980s. Introductory books of fractal geometry use visual images to express the relationship between mathematics and nature.

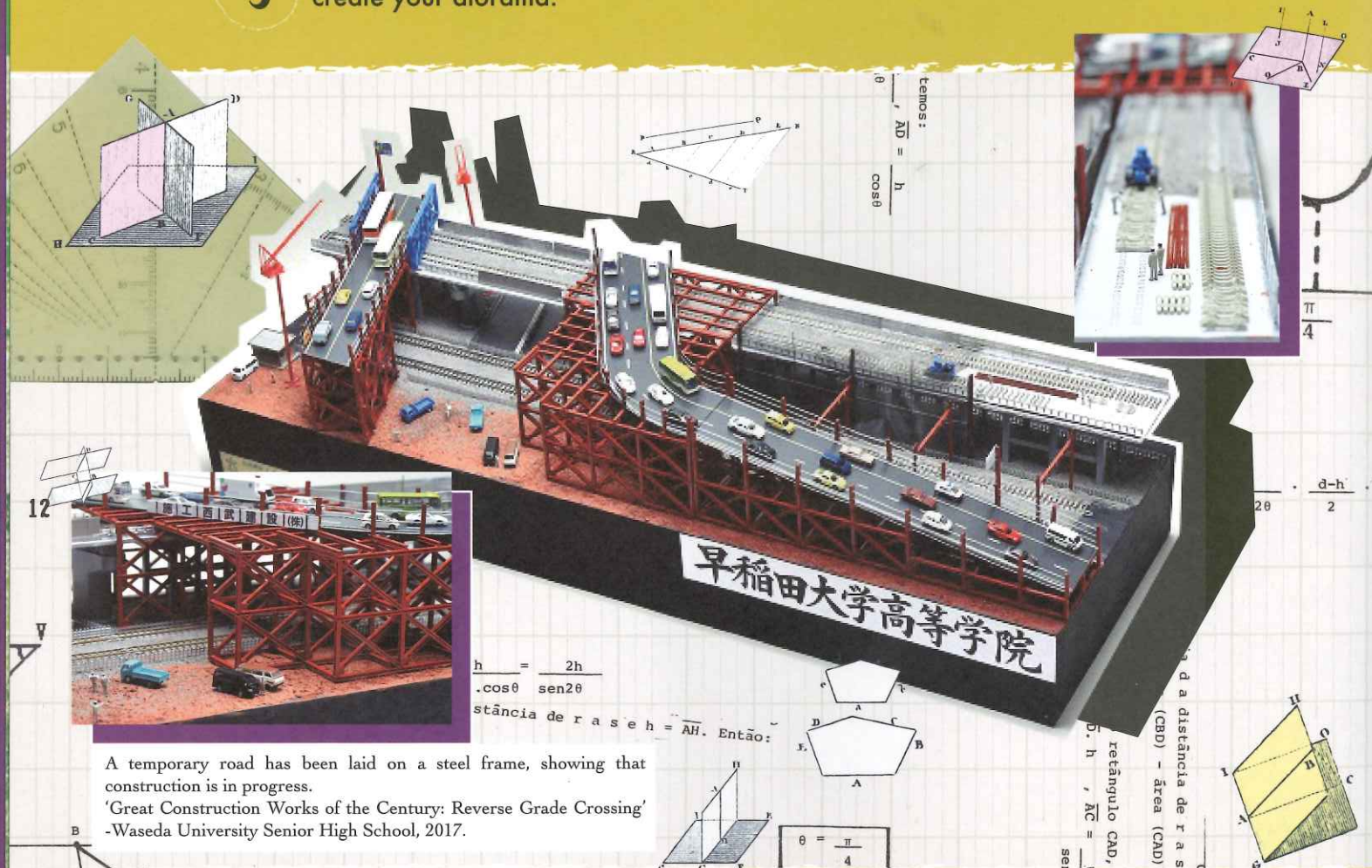




# 05 Observe Human-Made Structures

- 1 Keep in mind the basic principles of human-made structures: straight lines and zero waste.
- 2 Be aware that human-made structures weather over time.
- 3 Learn the characteristics of the cityscape and use this information to create your diorama.

POINT



A temporary road has been laid on a steel frame, showing that construction is in progress.  
 'Great Construction Works of the Century: Reverse Grade Crossing'  
 -Waseda University Senior High School, 2017.

Human-made structures are also essential elements of railway model dioramas. As you can see in the picture above, the character of a city, which is made of structures such as railway tracks, roads and buildings, is clearly different from that of nature. So where do the differences come from?

One of the defining characteristics of human-made structures is the straight line. Straight lines are convenient for making buildings and roads. It's easier than making curved shapes, and there's no waste when cutting or assembling materials. People build structures by exploiting this characteristic of straight lines. As a result, city streets are based on straight

lines. The Japanese physicist Hideki Yukawa also asked, "Why do humans choose straight lines? Because they are most convenient to handle in the sense that they obey the simplest rules".

While trees and other natural objects are formed so that there is no waste, human-made structures are created by people with a particular aim in mind. Therefore, they have less ambiguous shapes, and we need to design dioramas in a much more precise and detailed way than we see in nature.



## The Shapes of Human-Made Structures Are Based on the Principles of Straightness and Zero Waste

When you look at things around you and buildings in the city, you will find that everything is made of straight lines. This is the result of our efforts to minimize waste and make things efficiently. When making towns and human-made objects in dioramas too, we depict shapes conceived by humans with no waste. Eliminating ambiguous elements is key. However, if you intentionally depict an ambiguous area like a vacant lot that results where the road is curved, it can lead to a sense that it too, is made by humans.



Tokyo scene. Tokyo Tower has curves, but they have a regular shape that is not natural.



JR San-in Main Line, the old Amarube Viaduct in Kami-cho, Hyogo Prefecture. The framework is constructed of straight steel frames.



Fields and rice paddies are also made by humans. They are laid out in straight lines to avoid unnecessary work.  
 -Rural area of Fukushima City, Fukushima Prefecture



## Study the Surface Changes of Human-Made Structures and Use the Information in Your Diorama

The surfaces of buildings such as roofs and walls are in contact with the rain and wind in the atmosphere. As time goes by, iron gets rusted due to oxygen and water in the air, and external walls change colour as they become coated with mould and moss. Also, the walls of wooden houses become darker over time, giving them character. Carefully observe the changing colours and patterns on the surface and use them in your diorama model. Depicting these changes with pastel colours and paints will further increase the impression that they are made by human hands.



Water on the surface of iron absorbs oxygen from the air, causing a chemical reaction that results in rust. Applying a rust-coloured paint to your model shows that it is made of iron.



Peak Station has protected its passengers from wind and rain for over 50 years. The colours of its walls tell the story of the passage of time.  
 -Komagatake Peak Station on Hakone Komagatake Ropeway

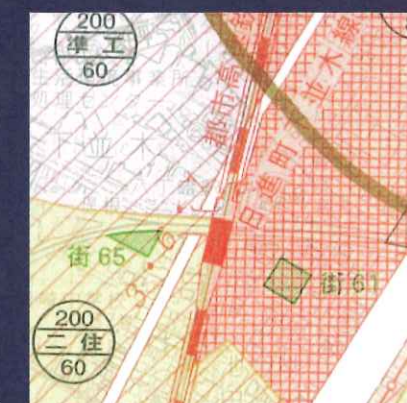


Wooden walls darken in colour over time, due to the effects of sunlight. Some people say that the wood becomes more beautiful and increasingly stylish as it ages.



## Find Out How the Land Around the Railway Line is Used

If you use a certain city as your model, look at maps of the city to understand its characteristics and how it developed, and use this information in your diorama. For example, some cities have land use zones that define the purposes that the land can be used for and publish this information on maps. Check whether the area around the railway line is zoned for residential or industrial uses, and make your diorama match the actual city landscape and atmosphere.



A map of land use around Hatchonawate Station in Kawasaki City, Kanagawa Prefecture. The eastern or right side of the station is a commercial area, the western side is residential, and the northern side is semi-industrial.

-Source: Kawasaki City Planning Map (Kawasaki Ward)



Geospatial Information Authority maps reveal the exact locations of actual buildings. They also have a 3D display function. The residential map (Zenrin Co., Ltd.) provides details on the location and information of each house.  
 -Source: Geospatial Information Authority of Japan

## Learn More



Some people choose a city set in the recent past for their diorama model. The Topographical Survey web page on the Geospatial Information Authority's Maps and Aerial Photography website shows aerial photographs of different areas at various times. There's another site called Konjaku (Then and Now) Map where you can see maps and aerial photos side-by-side; for example, a map representing the city as it is now, and an aerial photo taken in the period 1961 to 64.



# 06 Learn About the Way Our Eyes Move

- 1 The human gaze turns towards things that stand out.
- 2 When you learn how our eyes move, you will be able to plan your layout more effectively.
- 3 You can also use illusions to attract viewers to your work.

POINT



"IJsselstein" by Peter Dillen

The picture appears to have depth, but the creator has used a special technique that uses the characteristics of human vision to give an illusion of depth (see next page for more details).  
-Peter Dillen's IJsselstein

When people look at something, their gaze is fixed in a certain way. There are times when you notice yourself that while you intend to look in one direction, your gaze is directed by an external stimulus, or you notice that you've already looked at something without realising it. For example, your attention gets naturally drawn to something that is sparkling, brighter than something else, or moving. This is called stimulus-driven attention and means that your line of sight is influenced by such external stimuli. You can exploit the way people see to attract their attention to what you want to prioritise in your diorama.

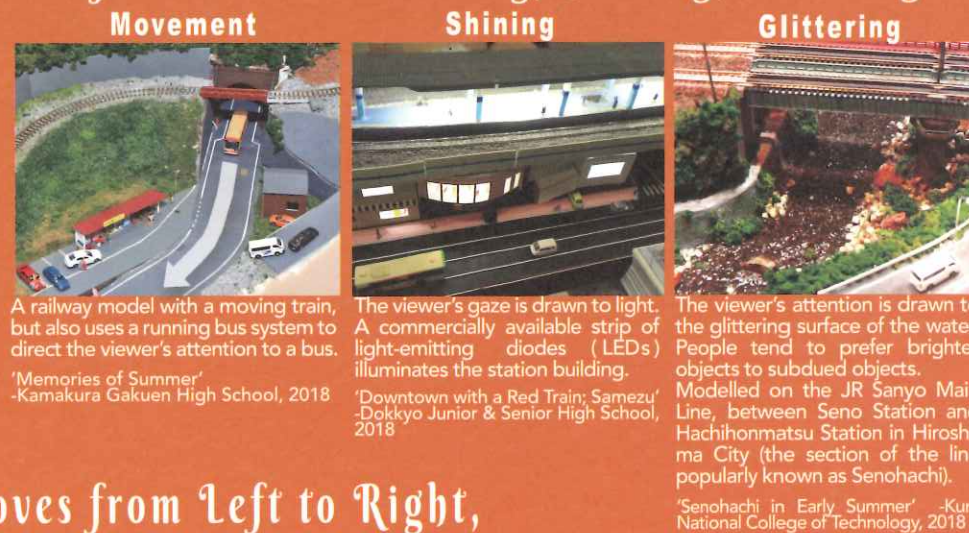
In general, the human gaze goes from left to

right, from front to back, and from big to small. When creating a diorama, place what you want to highlight on the natural path of the human gaze, and the viewer will understand your intention. People can also be tricked into thinking that a flat scene like a painting or a photograph can have depth if certain techniques are used. These techniques to alter appearance can also be incorporated into railway model dioramas.



## The Gaze is Drawn to Objects that are Moving, Shining, and Bright

When people look at a diorama, their eyes turn to features that stand out, such as those that are moving, shining, glossy, bright, or vivid. By using this stimulus-driven attention mechanism, you can more effectively make viewers look first where you want them to look.



A railway model with a moving train, but also uses a running bus system to direct the viewer's attention to a bus.  
'Memories of Summer'  
-Kamakura Gakuen High School, 2018

The viewer's gaze is drawn to light. A commercially available strip of light-emitting diodes (LEDs) illuminates the station building.  
'Downtown with a Red Train: Samezu'  
-Dokkyo Junior & Senior High School, 2018

The viewer's attention is drawn to the glittering surface of the water. People tend to prefer brighter objects to subdued objects.  
Modelled on the JR Sanyo Main Line, between Seno Station and Hachihonmatsu Station in Hiroshima City (the section of the line popularly known as Senohachi).  
'Senohachi in Early Summer' -Kure National College of Technology, 2018



## The Human Gaze Moves from Left to Right, Front to Back, and Big to Small

How does the viewer's gaze move after seeing something that stands out? First, it tends to move from left to right. This may be related to the habit of reading horizontal text from left to right. The tendency for the gaze to move from front to back is also strong. This is because people try to pay attention to what is nearby. Therefore, place what you want to emphasize in the area extending from the front left to the right rear of the layout, making it easier for the viewer to focus. The human gaze also moves from big to small objects.



Think of how the gaze moves from left to right and from front to back and lay out what you want to highlight on the pink line.

The movement of the viewer's gaze from big to medium and medium to small can also be used for organizing your layout.



## Use the Perspective Method to Give the Impression of Depth

Perspective is a method of painting that aims to depict distant or nearby scenery with the same sense of distance as seeing it with our eyes. Even on boards that don't have much depth, you can give a sensation of depth by making things at the back look smaller. There are also techniques such as making the scenery behind paler by making use of the phenomenon that things in the distance look washed out. You can also use the perspective method when you paint scenery on a wall behind the board.



The diorama in the photo on the left-hand page is actually not very deep when viewed from above. Everything is distorted to give the viewer a sense of depth.

## Learn More

The creator of IJsselstein, introduced on the left-hand page and in the topic above, is Peter Dillen, a Dutch artist. He has also made dioramas such as Veldhoven that appear to jump out of the picture frame. You can see some more of his work on his website.

Go to [www.rail-navi.jp/diorama-ijsselstein-en](http://www.rail-navi.jp/diorama-ijsselstein-en) (English)





# 01 Be Clever Using Materials and Tools

- 1 The materials for your diorama are all around you.
- 2 Learn the characteristics of the tools to use them better.
- 3 Try copying what impresses you about other people's skills and models.



Ideas  
come  
from  
TOOLS



Tools and materials used for making model railway dioramas.

Materials are the building blocks of your diorama. These include plaster of Paris for dissolving in water to create the topography, sprinkled turf to depict meadows and the surface of the ground, plastic sheets for cutting and painting to build, and also adhesives, drawing materials and paints. But it's not just products made specifically for dioramas. Various products sold at discount shops can be used as materials, depending on your ideas. Thinking about the materials that can be used to achieve what you want to create will increase the fun of making your diorama. Tools help us make materials into the desired shapes. These include cutting knives for cutting

paper and plastic, plastic brushes for colouring, and files that smooth rough surfaces. Even if you can't buy lots of different tools, you can use them for multiple purposes if you think about their advantages and disadvantages. Ideas on the use of materials, tools, and techniques are often passed along from one person to another. If you see what someone else is doing and you want to try it yourself too, you can copy what they've done. Also, if you try your own ideas and fail, the experience of failure can be valuable if you think about why it happened and apply the knowledge elsewhere.

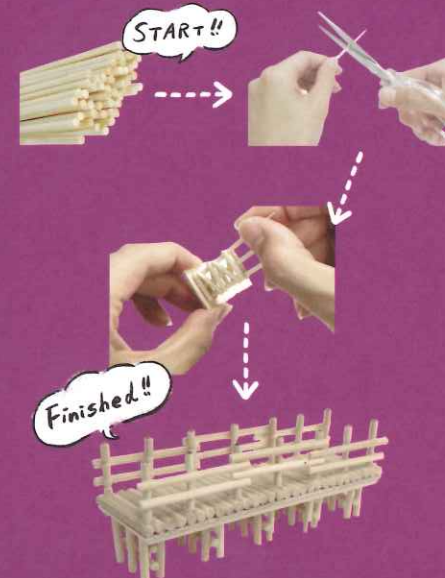


## Use All Kinds of Materials to Express Your Ideas

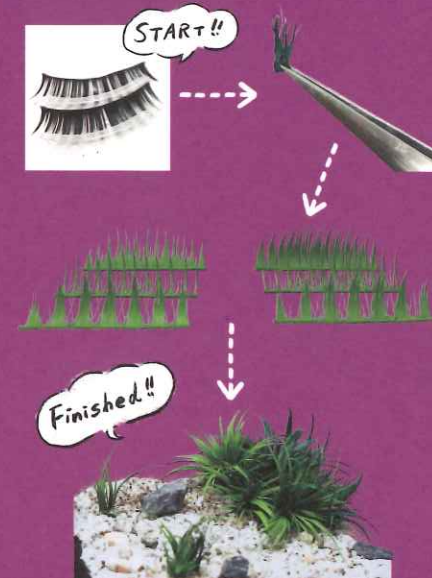
Many of the small daily necessities that are sold at discount shops and home improvement stores are shaped or patterned in the same way as buildings and land in the 1/150th diorama world. You can find the materials for your diorama by thinking about what is available and what materials would make it possible. Woodworking glue can be peeled off metal after it dries and can be used in many ways to make models. The use of materials other than those made specifically for diorama modelling has the advantage of reducing the sense of unnaturalness of your model and increasing its level of interest.



Skewers and toothpicks are similar in shape and texture to logs and wooden columns, and are easy to use for modelling wooden structures.

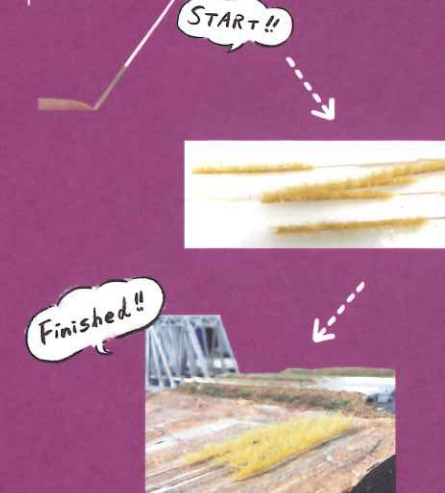


False eyelashes are composed of multiple hairs joined at the base and can be used to represent bushes.



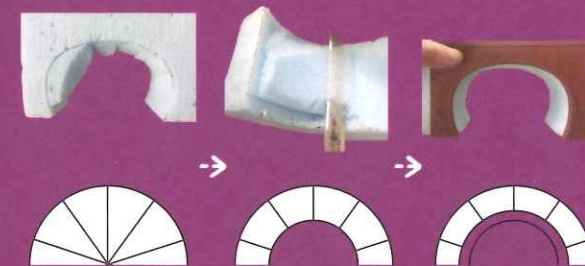
Apply a special glue to model grass in straight lines on a flat sheet and place the grass fibre material in a special device to generate static electricity before sowing. Align the sown

grass material with the copper wire and stand the grass up with your fingers. This technique allows you to simulate the striped pattern of fields and rice paddies.



## Tools Are Devices for Thinking. Consider Their Characteristics Before Using

The tools you need will differ according to the materials you want to use and the objects you want to make. You can buy tools for specific purposes, but just having a set of basic tools will allow you to most make models and dioramas. It is important to consider the advantages and disadvantages, as well as the characteristics of basic tools. When you have to do something that you are not good at, you may be able to do it by working at the task a little bit at a time. Depending on the compatibility between the tool and the material to be handled, physical or chemical reactions may occur, allowing the material to be used effectively. Always take care to avoid injuries and accidents when using tools.



Cutting knives are not good for making deep cuts but you can use them to make rounded shapes like the entrance of a tunnel by making successive small cuts.



If you don't have a device for making grass stand up, put grass powder in a plastic container and shake it, the powder will become fluffy and it will look like the grass is standing up. The surface of the plastic container induces a static electric charge on the powder.

## Learn More

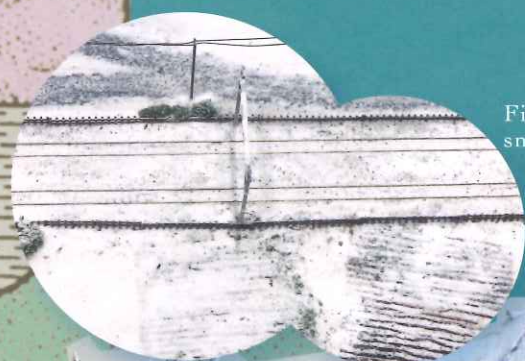


There are many books and websites that explain how to use tools and materials. In Kenichi Nomoto's *Modeling Laboratory* [New Revised Edition] (Hobby Japan), tools for model making are shown in catalogue form, and the features of each can be seen clearly. Well-illustrated instructions for making actual models can be found in the *Introduction to Model Railway Layouts and Dioramas* (Neko Publishing) and the *Textbook for Model Railways* (Jitsugyo no Nihonsha).

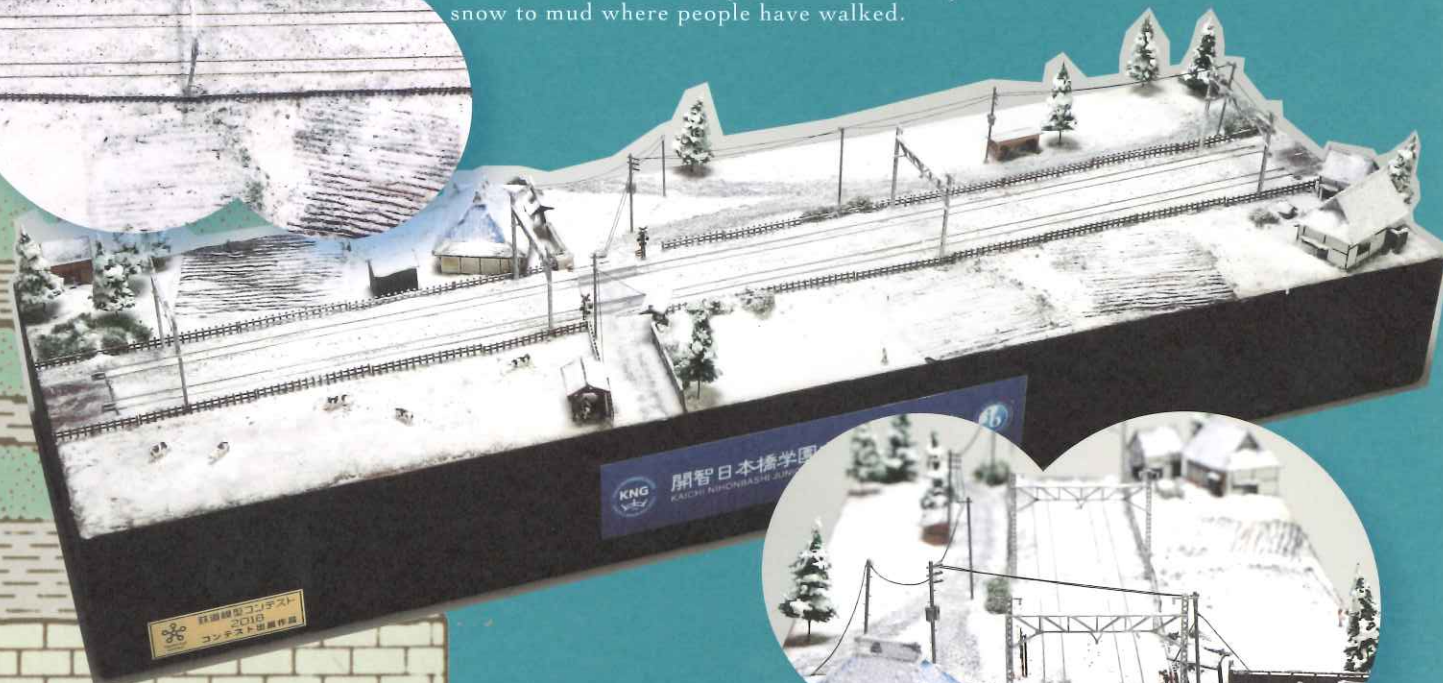


# 08 Improve Your Depiction of the Ground Surface

- 1 Learn about the types of soil in Japan and create a realistic impression with the colours of the model.
- 2 Learn about the various textures of the ground and aim to express them in your diorama.
- 3 Snow accumulates and melts in various ways. Knowing the nature of snow, create the appearance of a variety of snowfields.



Fields of snow can be depicted in several ways, from fresh white snow to mud where people have walked.



'Winter Scenery in Niigata'  
-Kaichi Nihonbashi Gakuen Junior & Senior High School, 2018.



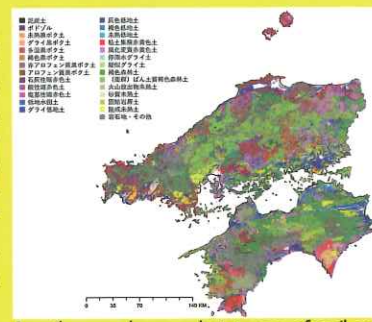
The ground is a major feature of dioramas. Stones called ballast are laid near the railway track, and grass grows on the soil outside the track (for grass, see Pages 22-23). In areas other than those around railway tracks where there are no forests or buildings, soil is found in fields, meadows, and pastures. You may think the colour of the earth is brown, but if you look at it in real life, you can see that it comes in various colours. There are many different types of soil in the world. If you find out what kind of soil is present in the area where the diorama is modelled and use the

appropriate colours, you will produce a more realistic effect. Snow-covered ground is also worth observing. When you think of snow, you might think that the entire surface is uniformly silver, but it looks different depending on how the snow falls, how it accumulates, and where it snows. Depicting these differences makes it possible to convey expressive snowscapes in your dioramas.



## Differences in Japanese Soil Types

There are many types of soil across Japan. You can see this clearly by looking at a soil map, which shows the type and nature of soils in different colours. Japanese soil can be divided into two major types: light-brown red soil and darker-black black soil. Red soil comes from volcanic ash and is found all over Japan, as the country has many volcanoes. Black soil is found in the top layer above volcanic ash and is often used in farmlands.



A soil map shows what types of soil are found in the area or location on which the diorama is modelled.

-Source: National Agriculture and Food Research Organization, Japan Soil Inventory website



Actual red soil and modelling turf of the same colour (NOCH Flock brown).

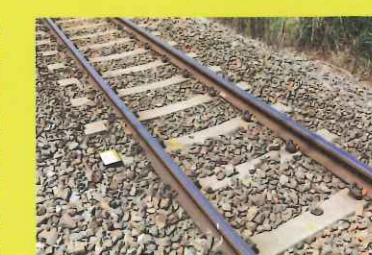


Actual black soil and modelling turf (Woodland Turf Black Earth Colours).



## The Texture of the Ground is Also Important

When depicting the ground, the texture of the material is also important. For example, soil grains are very small and fine, but the actual diameter of the rocks used for ballast on railway tracks is about 5 cm. If you are aware of the differences in size and fineness of each element of the ground and carefully choose the materials for the diorama, you will be able to maintain the right atmosphere. To make fine grained soils in a diorama, some people use coloured plaster instead of turf or powder.



Ballast laid on actual railways is composed of broken up rocks, so it is rough. Copy this texture in a diorama to create a similar atmosphere.

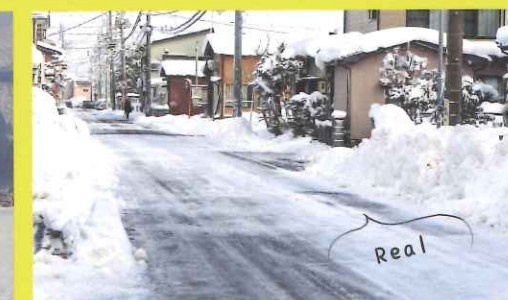


Use various materials to depict different textures such as ballast and soil in the field. The model shows the area near the Fukuchi signal station on the JR Takayama Line. 'Late Autumn Country Scene. Towards Hidaji' -Tezukayama Gakuin Izumigaoka Junior & Senior High School, 2018



## Snow Melts on Roads but Persists on Soil and Meadows

Snow scenes are a great source of diorama representation. The appearance of snow on the ground varies widely. Asphalt and concrete on roads readily store heat, and snow melts rapidly because of friction caused by moving cars and people, so the road surface underneath becomes visible. On the other hand, soil and grass do not transmit much heat to snow, and snow does not melt so easily. Try to reproduce the way snow looks and the way it melts to realistically convey the appearance of snow in a diorama.



The road surface tends to be revealed under snow. On soil and meadows, snow is slower to melt and remains uniformly silver. The diorama on the left-hand page shows that contrast. It is also full of detail, such as the footprints of passers-by.

## Learn More

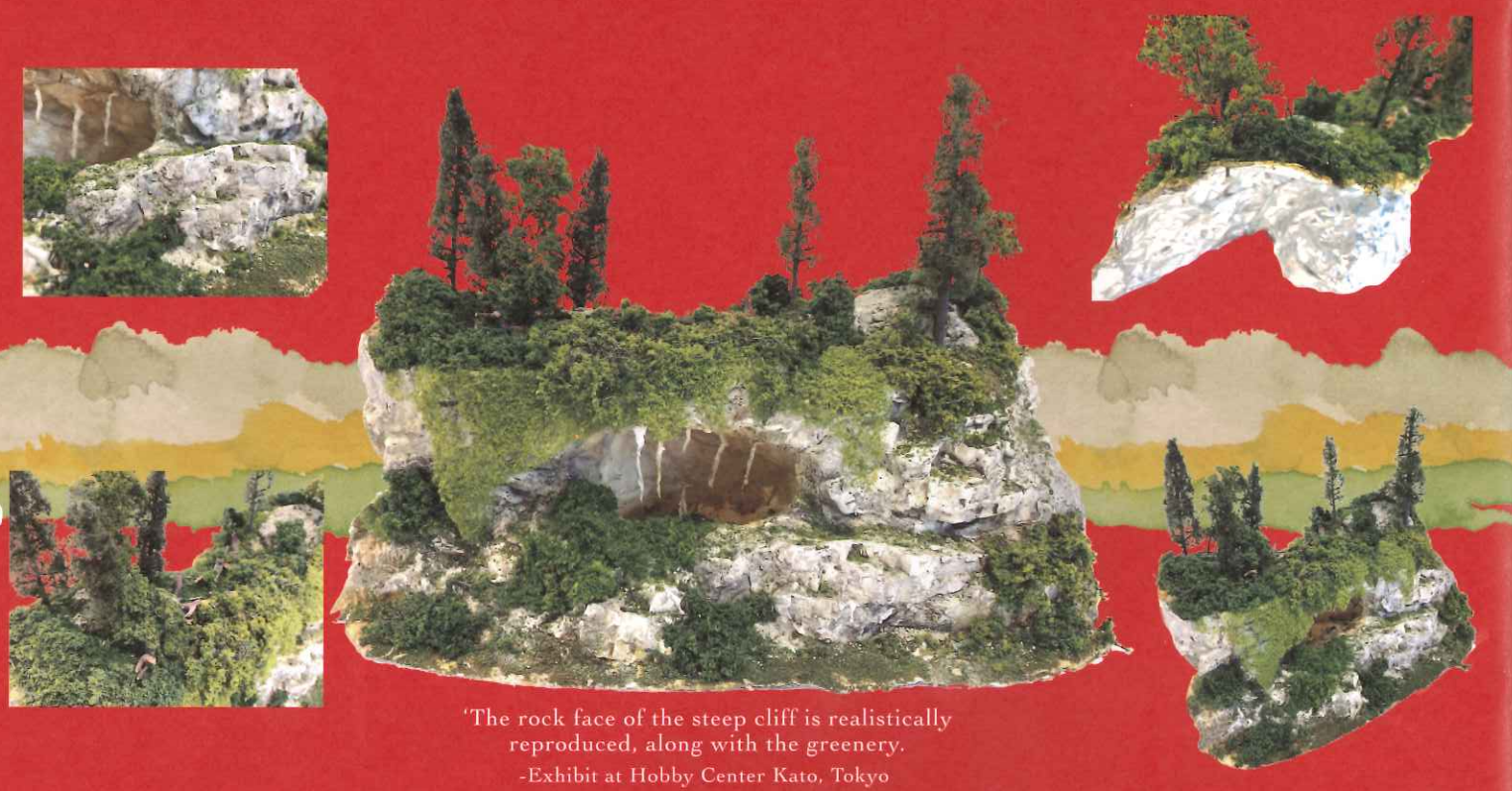
The black soil described above is also called andosol. It was thought that andosol was also the same as red soil, and originally volcanic ash. However, some researchers have argued that the ash produced when people in the Jomon period used fire was the main component of andosol. If so, our ancestors created this black soil. If you'd like to learn more about the mystery of this black soil, look for the book *Soils of Japan: Geological Research Reveals the Story of Black Soil and Jomon Culture* (Tohru Yamanoi, Tsukiji Shokan).





# 09 Improve Your Depiction of the Terrain

- 1 Geological strata are essentially parallel. You can depict them using materials and tools.
- 2 Cracks can also occur on the rock surface and in the strata. Knowledge of the mechanism can also be helpful in making dioramas.
- 3 Think about how railway tracks are laid in uneven terrain such as mountainous areas and use this knowledge in your diorama layout.



The rock face of the steep cliff is realistically reproduced, along with the greenery.  
-Exhibit at Hobby Center Kato, Tokyo

The Earth's topography is characterised by high points, low points, and undulating landscapes. We see this topography as cliffs and mountains. Rocks and strata are exposed in cliffs. Places where strata and rocks appear on the surface are referred to as outcrops. Strata tend to have parallel patterns, but they may be diagonal, slanted, or bent. Observing the pattern of the strata and modelling the strata can enhance the appearance of the topography. At outcrops, you sometimes see rocks that are not in strata. Many of these rocks come from volcanic lava. The surfaces of rocks in cliffs are

rarely smooth, and they may have cracks or rough surfaces. Depict these features to create realistic landforms in your diorama. Mountains are formed by the continual movement of the tectonic plates that form the Earth's surface, which can cause wrinkling and the accumulation of lava spewing from the magma below. Landscapes formed by wrinkling can become a chain of mountains. On the other hand, mountains created by volcanoes often become independent features like Mt. Fuji. Decide on the shapes of mountain slopes and undulations by modelling the railways that climb up and run through, over, and around the mountains.



## Geological Strata are Basically Parallel

Strata are essentially composed of rocks that are stacked in layers. In each geological period, layers are formed by the accumulation of soil and sand with different characteristics; heavy soil first accumulates below and lighter soil then accumulates on top. Because the widths of the soil and sand layers are the same for each period, the strata are parallel. Therefore, you can depict the strata in your diorama if you use materials and tools that can create parallel lines. It will look more realistic if you use actual strata as models and paint them appropriate colours.



Reproduce the patterns of the actual strata. Layered patterns can be created by carving materials such as Styrofoam.



Railway tracks combined with dynamic strata.  
-Shiba Gakuen Junior & Senior High School, 2012



## Cracks Make Rocks Look Natural

Real rocks have cracks. There are two major types of cracks. One is called a fault, where the rock is broken and displaced by a force applied to the surface of the earth. The other is called a joint, which is a split without any displacement. There are several types of joints, but the main ones are created when rock cools and contracts. When magma from a volcano loses its heat and cools, many cracks are created simultaneously. In your diorama, you can highlight the characteristics of the rock by painting the cracks black.



Rocks on actual cliffs are rugged and feature joints and other cracks. To reproduce this look, pour plaster into a mould and allow it to harden to make the desired shape. You could also use a commercial product called Rock Mould, or by crinkling aluminium foil.



## Consider the Relationship Between Railway Tracks and Mountains

Mountainous terrain presents challenges for laying railway tracks. Railway cars are long and narrow, and coupled together, so they can't navigate sharp curves or steep slopes. There are several different ways to lay tracks, especially in restricted terrain. For example, digging a tunnel or building a bridge are ways to get the track through a mountainous area. Think about how tracks pass through mountainous terrain and use these ideas for your own diorama layout.



Climbing mountains

In Japan, the steepest railway that does not use gear-type rails is the Hakone Tozan Railway, with a gradient of 80 per mill. The steepest such railway in the world is the Lisbon streetcar in Portugal, with a gradient of 135 per mill. The unit "1 per mill" is an abbreviation for one in one thousand and means that the slope increases 1 m in height over a distance of 1000 m.

Following the line of the mountain

When a railway climbs a mountain, it often runs parallel to the slopes and cliffs. In some places, slopes and cliffs are protected with concrete and plants to prevent landslides.

Tunnelling through the mountains

Tunnels are excavated so railway tracks can pass through mountains. At the entrance, a concrete structure protects the train from falling rocks and avalanches.

Bridges between mountains

Bridges are built to span valleys between hills. Railway tracks often enter tunnels after crossing a bridge.  
-Hakone Tozan Railway, Hakone-cho, Kanagawa Prefecture (all photos are of the Hakone Tozan Railway).

## Learn More



You may be able use contour lines on topographical maps to create mountainous terrain in your diorama. You can find examples by searching for images on the Internet using the search term "stacked layers". Also, the NHK video clip mentioned below shows the process of making a layered model of Mount Asama, on the border between Nagano and Gunma Prefectures, from topographical maps and materials. Make a Three-Dimensional Model from a Topographical Map.

Go to [https://www2.nhk.or.jp/school/movie/clip.cgi?das\\_id=D0005401250\\_00000](https://www2.nhk.or.jp/school/movie/clip.cgi?das_id=D0005401250_00000)



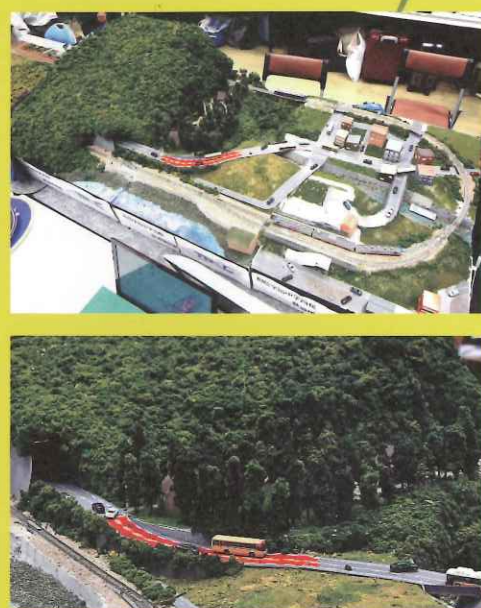


# 10 Improve Your Depiction of Trees and Grasses

- 1 Half the forests aren't just one colour. Examine the appearance of different trees to enrich your diorama's forest scenery.
- 2 Trees sometimes differ in colour from what we imagine they are. Cherry blossoms are actually white.
- 3 Grasses and trees are connected through succession. Use this knowledge to approach a realistic depiction of nature.



Different colours are used for the forest, and tall trees are placed individually in front to convey the appearance of various trees.  
-Toin Gakuen Junior & Senior High School, 2017



Forests occupy most of Japan's land area. Many railways run through green areas and forests are one of the popular diorama elements in railway models. Many dioramas incorporate trees into the layout. When you look closely, you'll notice that there are forests whose leaves are almost the same colour and there are forests with different colours. This is the main difference between coniferous and broadleaved forests. When making a diorama, it's helpful to observe and research the forest in the proposed location and reflect the coloration of trees in your model.

People tend to have an image of the colour of a tree in their mind that may be different from the actual colour. Cherry blossoms are an example. In dioramas, it is usually preferable to make the colour stronger, but this can feel unnatural if you make it too far from the real colour. If you take photographs and analyse the colour of leaves and flowers of natural trees, you can make your diorama feel more natural. In addition, dioramas tend to divide plant communities into areas such as meadows and forests, but there are also areas with transitions such as this: Moss→Grass→Low Trees→High Trees. Depicting the fuzziness of nature in your diorama will increase its naturalness.

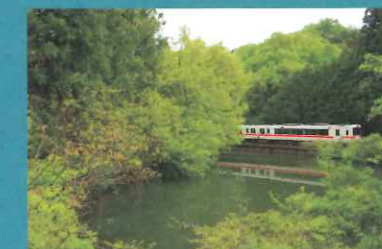


## One Type of Coniferous Forest and Many Types of Broadleaved Forest

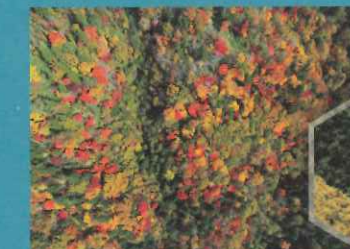
Forests can be broadly divided into two types: coniferous forests, which have large trees with needle-shaped leaves, and broadleaved forests, which have trees with broad leaves. Coniferous forests tend to be the same colour, because people often intensively plant one kind of tree such as cedar or cypress. Broadleaved forests are found mostly in their natural state, and any individual forest can include various kinds of trees such as maple, cherry, Japanese elm and beech. Some forests have mixed conifers and broadleaved species. Think about the type of forest you want to depict in your work and then decide on the appropriate colours.



Coniferous forest consisting of trees of the same species.  
-JR Takayama Main Line. Near Shimohara Dam, Gero City, Gifu Prefecture



The green colours of broadleaved forests, consisting of various kinds of trees, are also mixed.  
-JR Hachiko Line. Near the lake in Yorii, Saitama Prefecture



Natural broadleaved forests show a variety of colours because the colour and timing of autumn leaves depend on the tree. Some trees are still green. This diorama shows the coloration of the autumn leaves.

-Exhibit: High School Model Railroad Contest, 2017



## Cherry Blossoms Are Not Pink but White

What do you say when someone asks you the colour of cherry blossoms? Some people may imagine they are pink, but the colour of the Yoshino cherry blossoms that you often see is actually white (colourless) and is only slightly pinkish.



Cherry blossoms in real life. JR Tadami Line, near the Miyashita Dam in Mishima-machi, Fukushima Prefecture. Analysis of the cherry blossom shows that it is almost completely colourless, with few colours contributing to the final hue: cyan (blue) 0%, magenta (red) 5%, yellow 2%, and black 0%.



The focal point of the diorama is the cherry trees in full bloom, but the colours are subdued to give it a realistic look. Gunma Prefecture's Watarase Keikoku Railway Mizunuma Station is the model.  
-Small Railway Station Overlooking Mountain Cherry Blossoms and Water' -Rikkyo Ikebukuro Junior & Senior High School, 2018.



The colour of the flowers is almost white, but it still conveys the atmosphere of Yoshino cherry blossoms.  
'Spring Light to Sparkling Water Village, Nishi Waseda' -Rikkyo Niiza Junior & Senior High School, 2018.

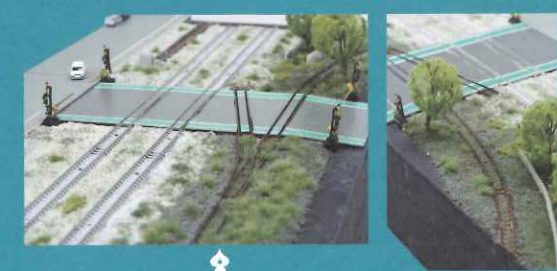


## Transition from Bare Ground to Forest

When plants begin to grow on bare ground with no plants and trees, they change the local environment. Mosses and other simple plants move in at the beginning, then the plant community changes over time to include grass, low shrubs and higher trees. This is a process called natural succession, and it's quite common to say that trees grow on meadows. Reflecting this pattern of succession in the plants used in your diorama will convey a more natural feeling.



Example of natural succession. It's more realistic to see mixed plants in the process of succession.



Depicts the appearance of grass and other plants starting to grow on the bare ground that is the railway track. Trees also contribute to the atmosphere.  
-Fujisawa Koka High School, 2017

## Learn More

Which forests are more common around railway lines? Coniferous or broadleaved forests? If you search on the terms forest and railway in photo libraries or stock photo sites such as Pixta, you'll find plenty of photos of forests and railways. It looks like broadleaved forests might be more common ...





# Improve Your Depiction of Water

- 1 Water looks different in the sea and rivers. Look carefully at the appearance of the water's edge to depict it in your model.
- 2 White-capped waves only occur under certain conditions. Your diorama will be more realistic if you depict the waves according to those conditions.
- 3 Water and other liquids move from high points to low points under the influence of gravity. You can utilize this phenomenon when pouring liquid materials.

POINT



A diorama with a rural river motif. There are slight irregularities on the surface of the water, and rocks are also placed on the riverbank, giving the image of the gentle middle reaches of a river.

-Makuhari Junior & Senior High School, 2017



Waterscapes such as rivers, lakes, and the sea generally have a comforting or positive effect on the viewer. Even in a railway model diorama, scenery that includes water has a refreshing effect. Transparent liquid materials are used, so the basic properties are the same as those of real sea and river water. Therefore, water is surprisingly easy to depict realistically, as compared to forests and grass. However, it's important to closely examine the waterscape when you want to include it in a diorama. For example, if you look at the colour of water as it flows from a river to the sea, you'll notice that the colour of the water

upstream is green and that of the water downstream or estuary is bluer. You can aim for a realistic depiction by paying attention to the way the waves rise around the seashore and the way the bubbles form in mountain streams. In the past, water was modelled with glues such as woodworking adhesives that became transparent when hardened. Recently, more user-friendly materials such as Water System have become available, in addition to Realistic Water and Water Effect. Make your waterscape after closely observing the actual expression of water and use materials effectively.

## The Colour of Water Changes From the River to the Sea

Sunlight is a combination of the colours red, orange, yellow, green, blue, indigo, and violet. Water tends to absorb warm colours such as red and orange, and the complementary colour blue (another colour for white light) appears stronger. Therefore, the sea looks blue. Rivers, on the other hand, contain more plankton, algae, and other substances than the sea (especially the open ocean). The upper reaches of rivers are often surrounded by tree-covered mountains and other vegetation, so the green colour is reflected by the water. The upstream water in rivers therefore tends to appear greenish.



Coloured green, the water makes us aware that this is an upstream location. The arrangement of rocks is also effective.  
-Midsummer on the Joetsu Border  
-Omori Gakuen High School, 2017

The colour of the water changes from green to blue as it flows from the river to the sea.  
-Yoshino River in Tokushima Prefecture



The intense blue colour conveys the atmosphere of the ocean.  
-Tropical Rainforest Bordering a Certain Estuary  
-Nada Junior & Senior High School, 2012.



## Learn How Waves and Waterfalls Appear White

Moving water such as that in waves and waterfalls readily entrap air. The entrapped air forms innumerable small bubbles, which give it a white appearance. Waves in the ocean break in different ways. If the slope of the seabed is gentle, spilling breakers tend to occur, and if the slope is steeper, plunging breakers and bore breakers are likely to occur. For waterfalls, white bubbles are more likely to be produced if the slope is steep or the momentum of the water is strong.



After creating the sea surface or wave shape with Water System or other materials, paint the whitecaps with a paint such as Shiranami Colour.  
-Diorama created by the Model Railway Contest Organizing Committee



Even if the current isn't rapid, white bubbles tend to form where the flow is blocked.  
-Kurobe Gorge Railway, near Shin-yamahiko Bridge in Kurobe City, Toyama Prefecture

At a steep-angled waterfall, the water is white from its starting point.  
-Fujikyu Railway Otsuki Station, near Tahara Falls in Tsuru City, Yamanashi Prefecture

(Left) Spilling breakers. Tend to occur when high waves occur on a beach with a gentle seabed slope.  
(Middle) Plunging breakers. Tend to occur when the seabed slope is 0.1 (the depth increases by 10 m for 100 metres travelled)  
(Right) Bore breakers. The waves are gentle and tend to occur where the seabed is steep.



White cotton can be used to create a dynamic waterfall scene.  
-Diorama created by the Model Railway Contest Organizing Committee

## Use the Effect of Gravity on Liquids to Make Mountain Streams Realistic

Liquid travels from high places to low places under the influence of gravity. This is the same for both real flowing rivers and liquid diorama materials such as Realistic Water. So, just as with the flow of river water, if you let the liquid material flow from the upstream end of the model, the liquid will flow like it does in nature. This is particularly effective when depicting rivers on steep slopes such as mountain streams. The liquid goes into the gaps in every corner.



After forming the riverbed, pour the liquid material from the upstream part of the river.

## Learn More

Check this out if you want to express waterscapes in your diorama! You can easily learn how to use the materials in the Water System series developed by US company Woodland Scenics and sold by Kato in Japan, by watching the videos on the Woodland Scenics YouTube channel.



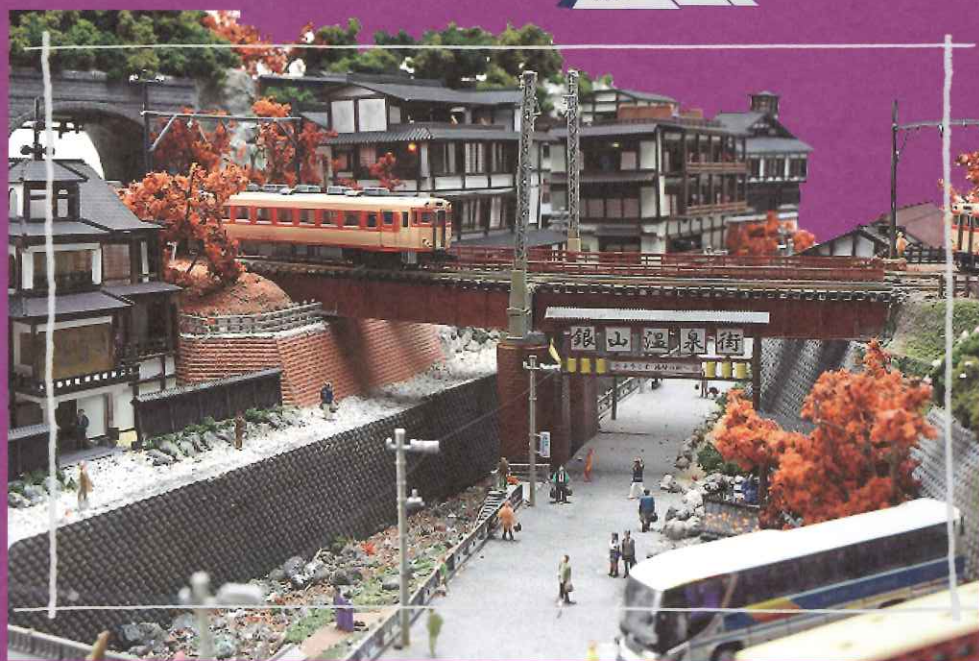


# 12 Improve Your Depiction of Human-Made Structures

1 Think about human-made structures from the perspective that nothing is new.

2 Light is reflected and scattered. Control lighting by thinking about the characteristics of light.

3 If you can't make buildings with a commercially available building kit, try making your own from sheets of plastic.



A Japanese inn, carefully designed and handcrafted from scratch. Modelled on Ginzan Onsen in Obanazawa, Yamagata Prefecture. -Tales of Ginzan Yukemuri. Nara College of Technology, 2017



By depicting natural landscapes in dioramas, we can convey the presence of living things such as trees, grasses, and animals. In the same way, depicting human-made structures such as buildings in dioramas can convey the existence and life of the people living there. Buildings get old with time. Since we don't make new ones every day, most of the buildings in the city should be somewhat faded or rusted, and they will look different from brand new constructions. Depicting the passage of time in dioramas with the idea that few buildings are new make the cityscape and human-made structures come to life. The painting method we use to indicate the passage of time is called weathering. It gives the sense that the building has



been used for a long time. Introducing weathering in your diorama may be a bold step, but if you acquire the techniques, you can create a more realistic atmosphere for human-made structures. You can also use night lights to show the presence of human activity. Lights provide evidence that people are present. Light emitting diodes (LEDs) can be used to represent lights in railway models and dioramas. If you can't buy the building you want to include in your diorama, try to make it yourself from scratch. It takes time and technique, but you gain a lot of satisfaction when you're finished.



## Human-Made Structures Are Basically Dirty

Although human-made structures start out clean, they inevitably get dirty over time. As there's no such thing as a completely clean building, try weathering a model or a diorama with stains to give the feeling of the passage of time. The word weathering originally meant the breakdown of rocks and other materials by the action of air or water, but it is also used for models of human-made structures.



This is not modelled after an actual station, but weathering the station buildings, overpasses, and platforms gives the impression of being in use for a long time. 'Last Train: Last Day for the Sanko Line' -Shudo Junior & Senior High School, 2018.



Use pastel colours

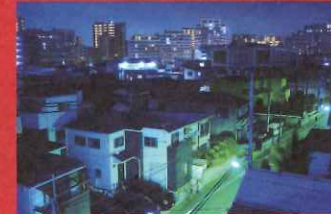


Use special paints



## Accentuate the Differences Between Light and Dark

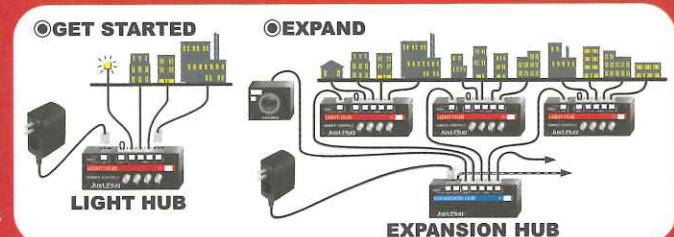
People turn on lights when it gets dark. But not every room in every building is occupied, so some rooms are lighted, and some remain dark. In your diorama you can use lighting to create an atmosphere of various aspects of life: "There's a family eating dinner in this room; They're working overtime on this floor; This room is vacant."



When you look at a town at night, some rooms are illuminated, and some are dark.



Use the Just Plug system to adjust the brightness of the LEDs for each light to express various lighting scenarios. Prevent the leakage of light by properly partitioning every floor or every room.

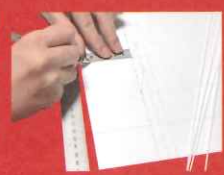


## Draw a Design and Make Buildings from Plastic Sheets

If you can't depict what you want with buildings you can buy, try making them from scratch using suitable materials. First draw your design, then make the component parts from materials such as sheets of plastic and assemble the finished product. It requires manual techniques which can be time-consuming, but it allows you to enjoy creating the cityscape exactly as you imagined.



In the photo on the left-hand page, the detailed design of the building is drawn from scratch. The building was then made from sheets of plastic. The builders were very particular about the interior.



Making a building from plastic sheets.



## Learn More



What is the relationship between railways and cities? Some railways were built because of the need to transport lots of people living in a city, and other cities grew up in response to the availability of railway transport. In the 2011 Great East Japan Earthquake, the coastal towns and railways in the Tohoku region were severely damaged by the tsunami. Plans to rebuild towns include the construction of new railways and stations. We can learn many lessons from looking at how railways are included in urban planning.



# 13 Create a World of Fantasy

- 1 A creative world can be made by combining two themes that are usually unrelated.
- 2 Expressing a two-dimensional concept in three dimensions can be enjoyable for both the creator and the viewer.
- 3 Pay close attention to the fictional story in which the railway appears. Depict your favourite world yourself.



This model depicts a scene in which a train leaves for space, based on a science fiction manga that was also adapted into an animated movie.

-To the Stars! From the Galaxy Express 999. Keika Junior & Senior High School, 2017

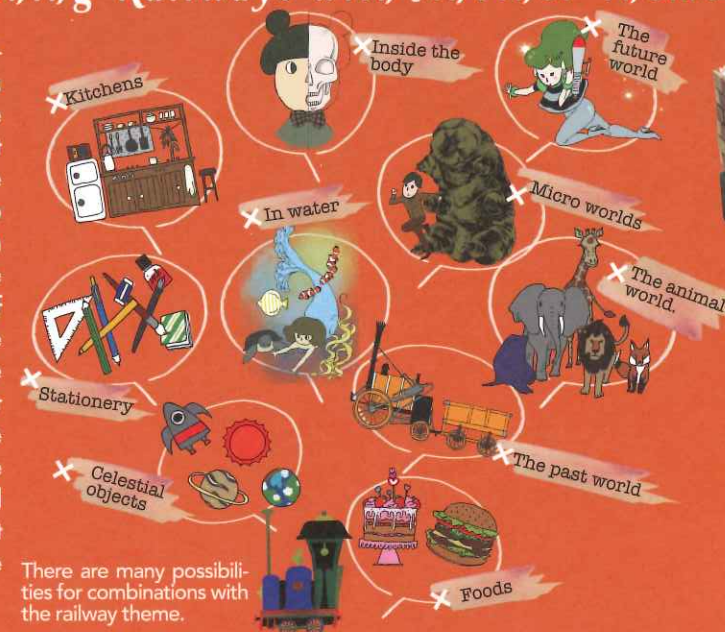
Another way to enjoy railway models and dioramas is to create a world that's not real. One advantage of dealing with models and dioramas that are smaller than the real thing is that you can make the world and shape you want to create with your own hands. Even if you don't have a real model, the world is yours to create.

A work created by the free imagination of the creator, regardless of type or model, is called fantasy. The British author JRR Tolkien (1892-1973), who wrote novels such as *The Lord of the Rings*, says that fantasy is created by the ability to make a mental image of what

is generally believed to be impossible, something that does not really exist, and cannot be found anywhere in reality. This thinking applies not only to literary works such as novels, but also to railway model dioramas. But few people can create fantasy works from scratch. Something that you see or feel usually becomes the inspiration for creating a model. For example, being inspired by a particular cartoon or graphic novel. Or you think about combining the inspiration with a model train to make a three-dimensional fantasy world.

## Try Combining Railways with Another Theme

If you combine two unrelated themes, you can make a creative world that no one has ever thought about before. Depending on the themes that you're trying to bring together, it could turn out to be an attractive combination. In the case of model trains, one of the two themes would be railway and the other theme your favourite anything, combining the two to create an original world. The theme that triggers the creation of the work is called a motif.



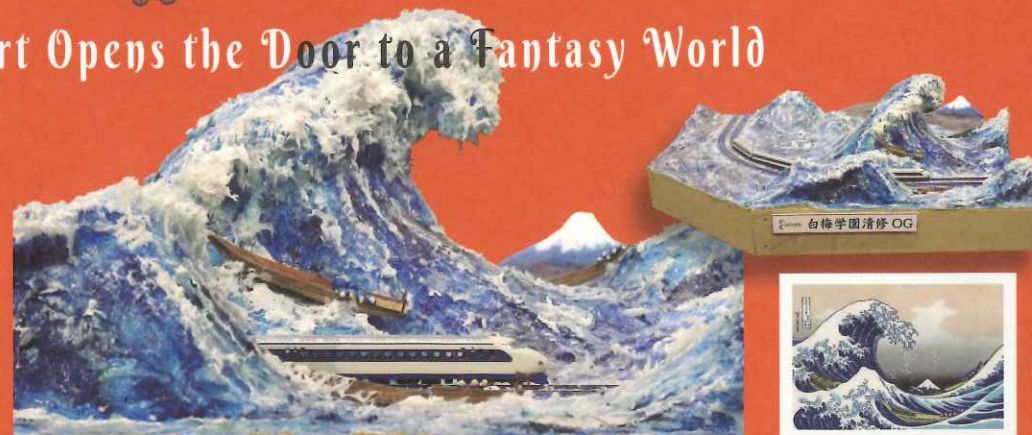
There are many possibilities for combinations with the railway theme.



A combination of railway and confectionery. The track runs under the cookie castle and scoops of ice cream sit on top of the castle. The confectionery items are made of clay. -Friends School, 2018

## Inspiration by Art Opens the Door to a Fantasy World

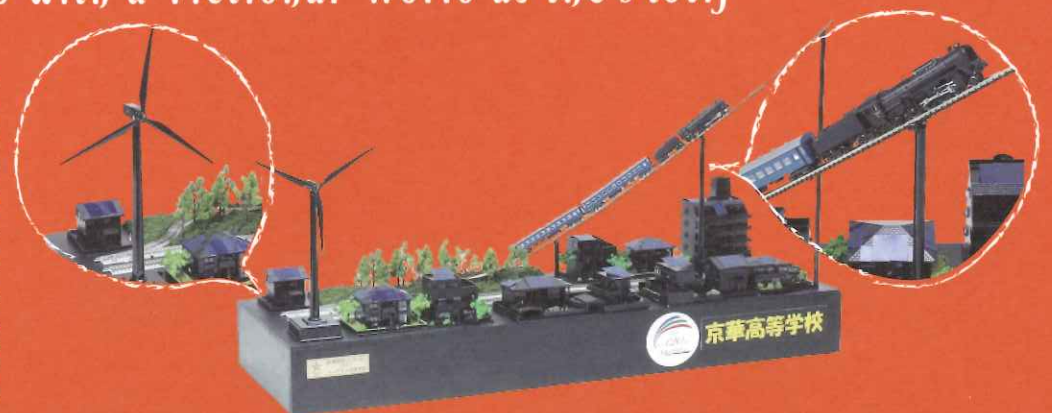
Paintings, graphic novels, and cartoons are drawn on a two-dimensional plane. However, a railway diorama is a three-dimensional model with a top and bottom, left and right, and front and back. If you think about how to represent this flat world in three dimensions, you open the door to a very creative outcome. Using a picture that inspires or excites you in some way, think about whether you could depict it in a diorama and how you might model it.



A three-dimensional representation of the Ukiyo-e Thirty-six 'Views of Mount Fuji: The Great Wave off Kanagawa' by Katsushika Hokusai. Seen from a certain angle, it looks like a traditional ukiyo-e painting, and it's fun to view from any angle. 'Three Hundred-and-Sixty Degree View of Mount Fuji' -Shiraume Gakuen Seishu Junior High School OG, 2015.

## Creating a World with a Fictional World as the Motif

In works of fiction such as movies, graphic novels, cartoons, games, stories, the author sets up the world and guides the reader through it. You can show off your imagined world in a model. Use your imagination for the parts that are not included in the motif, highlighting your skills and the fun of designing your work. It's also important to think about the context of the story, including any scenes that you omit.



The same diorama as that pictured on Page 28. Flexible track is used for the rails on which the locomotive and train run. The carriage is fixed so that it can be illuminated. The whole city, including buildings, is painted in dark colours to give the impression of night.

## Learn More

A well-known story about railways is Kenji Miyazawa's *Night on the Galactic Railroad*. Have you read it? In a dream, a lonely and poor boy named Giovanni, together with his best friend Campanella, who we later learn drowned while saving a classmate, ride the Galactic Railroad, stopping at stations among the constellations. When we think of Swan Station and other stops on their journey, the scenes immediately come to mind. *Night on the Galactic Railroad* has also been adapted into a movie and manga, so check it out if you're interested in how the story is visually depicted.

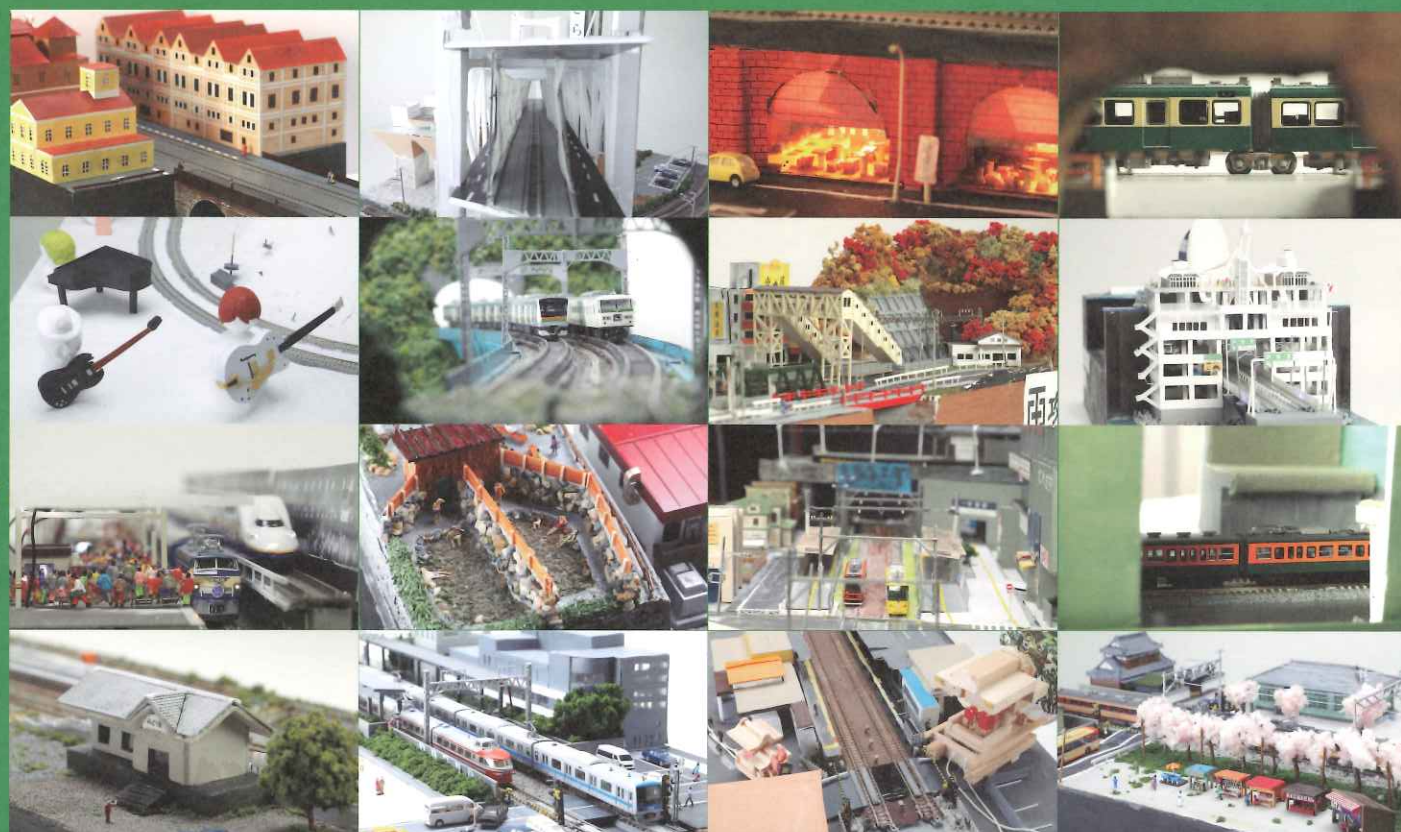




# 1A Promote Your Completed Diorama



- 1 When you take a photo of a railway model or a diorama, try not to blur the front or rear, so that it looks like a picture of the real world.
- 2 When shooting videos, use your smartphone's focus function to highlight the model train in motion.
- 3 Participating in exhibitions and contests allows your diorama to be viewed and appreciated by many people. It will also stimulate the creation of new work.



Exhibits at the Japan High School Model Rail Contest. The contest attracts many model rail fans who enjoy viewing and talking about the exhibits.

In addition to the fun of making a model railway diorama, you can also enjoy having people look at your creation and listening to their feedback. If you film your work on a smartphone and upload it to social media or YouTube, you can get feedback from people all over the world. If you record not only the finished work but also the process you followed to make your diorama, you can also show other people how to do the same. You can obtain direct feedback and reactions by displaying your diorama in events such as the Japan High School Model Rail Contest and Kato T-TRAK Diorama Contest. By speaking with the people who view your work, you can

also get information and inspiration for your next challenge. When people come to look at your work, point out all the features first, and then enrich their experience by providing additional information. An exhibition also gives you the opportunity to see excellent works made by other creators and to hear how to make them. There may be evaluations and contest awards on offer in the exhibition, so it will be even more exciting and stimulating. You can also network with other like-minded railway model enthusiasts.



## Learn About How Your Camera Works and Take Realistic Pictures of Your Model

When you photograph a railway model, the camera only focuses over a very short distance and the background becomes blurred, making it look like a model. If you want it to look real, you can reduce the camera's aperture or shoot from a greater distance, which increases the depth of field and eliminates blurring. However, at smaller apertures the shutter speed is decreased, and more light must be captured, and movement may cause blurring. In this case you need to stabilize the camera first.

Wide-open aperture

Depth of field is shallow



Focus

Blurring (opening the aperture makes the depth of field shallower)

Reduce the aperture

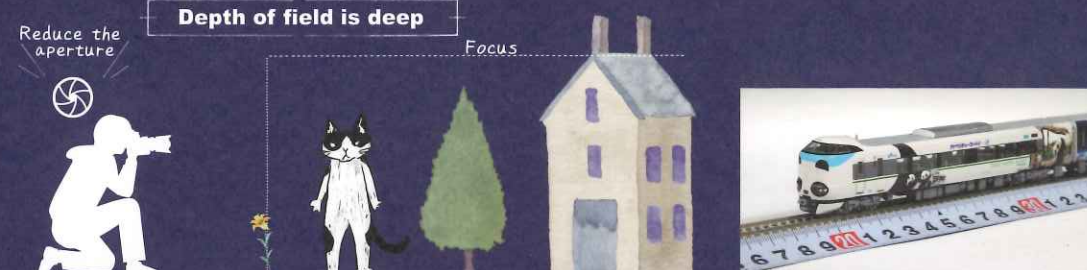
Depth of field is deep



Focus

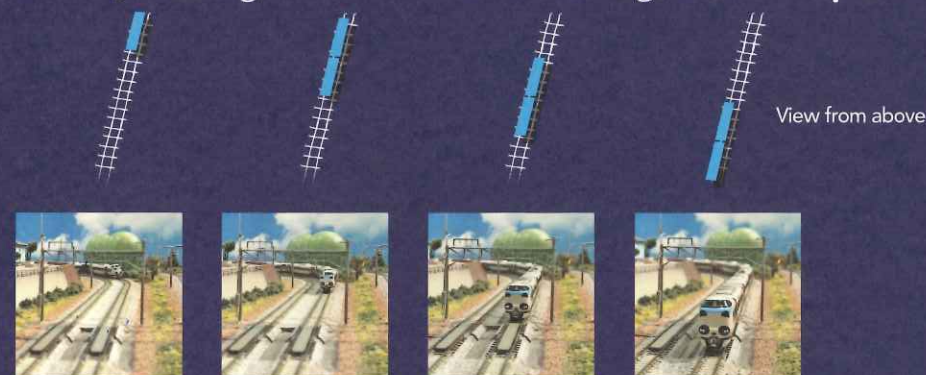
Reducing the aperture makes the depth of field deeper

The smaller the aperture or the further away the object is, the greater the depth of field. Use this technique to eliminate blurring of the background and make the picture look real.



## Continuous Focus on a Running Model Train Using a Smartphone

A smartphone is handy when you want to shoot a video of a moving model train. Stabilize the smartphone and focus on the rear of the track. When the train arrives from the other side, tap on the front of the first car on the smartphone screen with your finger, and press. The focus is then always on the lead vehicle. If you slow down the speed of the train, you can take pictures more accurately and clearly.



View from above.

Using a smartphone to continuously focus on a running model train.



## Describe the World in Your Model and Tell the Story of How You Made It

Different viewers look at dioramas in different ways. The title only tells the viewers one thing about the world you have created and talking about the production process, including the location of the model, and the techniques you used provides helpful information. Look at what people are interested in or ask them directly, and the answers will be helpful when you create a new diorama.



Sharing information about models with visitors.  
-At the 2018 Japan High School Model Rail Contest



<https://www.t-trak.jp>

## Learn More

The Japan High School Model Rail Contest for high school students and the Kato T-TRAK Diorama Contest for those over 18 years of age are held as part of the Model Rail Contest. Participants display dioramas of model railways, compete in events, and enjoy interacting with like-minded model rail fans. It is held in Tokyo every year. Why don't you make a model railway diorama and participate in the contest too!

